Draft

Preliminary Site Characterization Operable Unit 2

Quanta Resources Superfund Site Edgewater, New Jersey

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Executive Summary

This Preliminary Site Characterization Report (PSCR) has been prepared in accordance with the requirements of U.S. Environmental Protection Agency (EPA) Administrative Order on Consent (AOC) II-CERCLA-2003-2013 for Operable Unit 2 (OU2) of the Quanta Resources Superfund Site (Site) in Edgewater, New Jersey. This PSCR presents the results of sampling and analysis work described in the *Remedial Investigation /Feasibility Study Work Plan, Operable Unit 2, Quanta Resources Site, Edgewater, New Jersey* (Work Plan) (CH2M HILL, 2006). This information will be used to support the remedial investigation (RI), human health and ecological risk assessments, and feasibility study (FS) for OU2. A separate RI/FS is being performed for Operable Unit 1 (OU1) pursuant to requirements of the OU1 AOC.

The Quanta Resources property was used for the manufacture of paving and roofing materials from approximately 1876 to 1974, and for waste oil storage and processing from 1977 to 1981. The Site was listed on EPA's National Priorities List on September 5, 2002, and has been assigned CERCLIS ID NJ000606442. The Site is divided into two operable units, the Upland Area (OU1), and contamination in the Hudson River areas of the Site, including surface water and sediments eastward of the Hudson River bulkhead (OU2).

As stated in the Work Plan, the objectives of the RI sampling and analysis effort are as follows:

- Characterize potential sediment and surface water impacts associated with former industrial activities at the Quanta Resources property
- Define the nature and extent of Site-related potential constituents of interest (PCOIs), and delineate the impacts caused by the release of these chemicals to the surface water and sediments
- Evaluate the potential for human health and ecological impacts associated with the former industrial processes at this property
- Develop supplemental data to address data gaps within the investigations conducted to date to determine the need for and allow a screening of appropriate remedial alternatives, and the development of a refined conceptual site model (CSM).

This PSCR presents the field and laboratory data collected from October through December 2006, and provides a preliminary interpretation of the data. Additional data will be collected as part of the baseline ecological risk assessment (BERA). The OU2 RI Report will provide a comprehensive interpretation of all site characterization data and a present a refined CSM for OU2.

Field activities performed at OU2 from October to December 2006 included bathymetric and geophysical surveys (side-scan sonar, sub-bottom, and magnetometer), field screening to delineate the extent of coal tar impacted sediment using the tar specific green optical screening tool (TarGOST™), confirmatory sampling to verify TarGOST™ results, surface sediment sampling, and subsurface sediment sampling. A chemical fingerprinting study also was conducted to evaluate potential impacts of Site-related coal tar in Hudson River sediment in the vicinity of the Quanta Resources property. The results of the OU2 RI field investigation provided the following information:

- Characterization of the lateral and vertical distribution and extent of coal tar impacted sediment in OU2 based on TarGOST™ survey results
- PCOI concentrations in surface sediment from OU2, the area north of the former gypsum landfill, and at upriver and downriver locations
- Characterization of the horizontal and vertical distribution and extent of PCOIs in OU2 sediment
- Characterization of sources of polynuclear aromatic hydrocarbons (PAHs) in sediment based on the chemical fingerprinting study
- Characterization of the net sediment accumulation rate and depositional environment in OU2, and geotechnical characteristics of sediment

This information will be used to support the OU2 RI, baseline risk assessments, and FS. Impacts to Hudson River sediment from former industrial activities at the Quanta Resources property have been characterized based on this investigation. Surface water impacts will be characterized as part of the baseline ecological risk assessment (BERA). The nature and extent of coal tar and Site-related PCOIs in OU2 sediment have been characterized, although the extent of coal tar and selected PCOIs may need to be refined in specific areas to support the development of a remedy. Human health and ecological impacts associated with the former industrial processes at the Quanta Resources property will be characterized in the OU2 human health and ecological risk assessments. Sufficient data have been collected to characterize the properties of sediment for the purpose of developing remedial alternatives. Additional geotechnical data will be collected to support remedial design as necessary. The information and data collected in 2006 and to be collected as part of the BERA will be used to develop a refined CSM for OU2.

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Acronyms and Abbreviations

%RE	percent reference emitter
AOC	Administrative Order on Consent
BERA	baseline ecological risk assessment
bss	below sediment surface
CSM	conceptual site model
DGPS	differential global positioning system
DTI	Dakota Technologies, Inc.
EPA	U.S. Environmental Protection Agency
FS	feasibility study
in/yr	inches per year
LIF	laser-induced fluorescence
mg/kg	milligrams per kilogram
NAPL	non-aqueous phase liquid
OU1	Operable Unit 1
OU2	Operable Unit 2
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCOI	potential constituent of interest
PSCR	preliminary site characterization report
QA	quality assurance
QC	quality control
RE	reference emitter
RI	remedial investigation
ROST™	rapid optical screen tool
RTK	real-time kinetic
SVOC	semivolatile organic compound
TarGOST™	tar specific green optical screening tool
TOC	total organic carbon
TPH	total petroleum hydrocarbons
VOC	volatile organic compound

SECTION 1

Introduction

This Preliminary Site Characterization Report (PSCR) has been prepared in accordance with the requirements of U.S. Environmental Protection Agency (EPA) Administrative Order on Consent (AOC) II-CERCLA-2003-2013 for Operable Unit 2 (OU2) of the Quanta Resources Superfund Site (the Site) in Edgewater, New Jersey. This PSCR presents the results of sampling and analysis work described in the *Remedial Investigation /Feasibility Study Work Plan, Operable Unit 2, Quanta Resources Site, Edgewater, New Jersey* (Work Plan) (CH2M HILL, 2006). This information will be used to support the remedial investigation (RI), human health and ecological risk assessments, and feasibility study (FS) for OU2. A separate RI/FS is being performed for Operable Unit 1 (OU1) pursuant to requirements of the OU1 AOC.

The Quanta Resources property was used for the manufacture of paving and roofing materials from approximately 1876 to 1974, and for waste oil storage and processing from 1977 to 1981. The Site was listed on EPA's National Priorities List on September 5, 2002, and has been assigned CERCLIS ID NJ000606442. The Site is divided into two operable units, the Upland Area (OU1), and contamination in the Hudson River areas of the Site, including surface water and sediments east of the Hudson River bulkhead (OU2) (Figure 1-1).

1.1 Site Location and Description

The Quanta Resources property is located in Bergen County at 163 River Road, Edgewater, New Jersey (Figure 1-1). OU2 is located on a tidally influenced mud flat in the Hudson River to the east of OU1. These mud flats are exposed to approximately 500 feet from shore during low tide, and are flooded under approximately 6.5 feet of water during high tide. The river sediments consist of silt to clayey silt. Oily sheens have been observed sporadically in the mud flats adjacent to the Quanta Resources property, and an absorbent boom is maintained to control the sheens.

1.2 Study Objectives

The RI approach for OU2 is described in detail in the Work Plan (CH2M HILL, 2006). The objectives of the RI sampling and analysis effort are as follows:

- Characterize potential sediment and surface water impacts associated with former industrial activities at the Quanta Resources property
- Define the nature and extent of site-related potential chemicals of interest (PCOIs), and delineate the impacts caused by the release of these chemicals to the surface water and sediments
- Evaluate the potential for human health and ecological impacts associated with the former industrial processes at this property

- Develop supplemental data to address data gaps within the investigations conducted to date to evaluate the need for and allow a screening of appropriate remedial alternatives, and the development of a refined conceptual site model (CSM).

This PSCR presents the field and laboratory data collected from October through December 2006, and provides a preliminary interpretation of the data. Additional data will be collected as part of the baseline ecological risk assessment (BERA). The OU2 RI report will provide a comprehensive interpretation of all Site characterization data and a present a refined CSM for OU2.

The PCOIs identified for OU2, as documented in the Work Plan, are semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), and inorganic constituents (arsenic, chromium, lead, copper, mercury, nickel, silver, and zinc). Samples collected for the BERA will be analyzed for a broader list of analytes, including pesticides.

1.3 Document Organization

This document is organized in five sections and seven appendixes. Section 1 is the introduction and provides background information. Section 2 describes the scope of the 2006 OU2 RI sample collection and analysis effort. Field and laboratory results are presented in Section 3, and a brief summary of the PSCR is provided in Section 4. References are provided in Section 5. The appendixes provide supporting material, including a bathymetric and geophysical survey report, field records, analytical results, graphical plots of sediment chemistry data, and the chemical fingerprinting study report.

Field and Laboratory Investigation Activities

RI field activities performed at OU2 from October to December 2006 included bathymetric and geophysical surveys (side-scan sonar, sub-bottom, and magnetometer), field screening to delineate the extent of sediment affected by coal tar using the tar specific green optical screening tool (TarGOST™), confirmatory sampling to verify TarGOST™ results, surface sediment sampling, and subsurface sediment sampling. A chemical fingerprinting study also was conducted. These activities are described further below.

2.1 Bathymetric and Geophysical Surveys

The objectives of the bathymetric (hydrographic) and geophysical (side-scan sonar, sub-bottom profiling, and magnetometer) surveys of the river sediments within OU2 were to establish riverbed elevations and contours, and identify debris (from natural and/or anthropogenic sources) contained within the study area sediments. A Trimble real-time kinetic differential global positioning system (RTK-DGPS) was used to provide a horizontal location accuracy of better than 3 feet and vertical accuracy of better than or equal to 0.2 feet. Vessel position was determined using reference stations set up on control points that were previously established on the Quanta Resources property (OU1).

An Innerspace Technologies Model 455 fathometer was used to conduct the hydrographic survey. The side-scan sonar survey was conducted using an EdgeTech 4200-FS dual frequency (100-kHz/500-kHz) side-scan sonar system. Positioning data from the Trimble RTK-DGPS were collected and electronically paired with the side-scan sonar records to allow the location of targets to be selected during the survey and during post-processing.

The magnetometer survey was conducted using a Geometrics G-882 marine cesium magnetometer system, capable of plus or minus 0.1 gamma resolution. Data were recorded and electronically paired with positioning data from the Trimble RTK-DPGS in an onboard computer. An ODEC Stratabox sub-bottom sonar system was used to collect data about the thickness of subsurface sediments beneath the river. However, the sub-bottom profiling was unsuccessful because of the presence of organic, gaseous materials in the river bottom sediments. The bathymetric and geophysical survey report is provided in Appendix A, and a summary of the results is provided in Section 3.1.

2.2 Delineation of Sediment Affected by Coal Tar

The distribution and extent of sediment affected by coal tar in OU2 were estimated in the field using TarGOST™ laser-induced fluorescence (LIF). Confirmatory sediment samples were collected at selected locations to verify TarGOST™ results. As specified in the Work Plan, the TarGOST™ results and analytical data for sediment samples are being used to determine the spatial distribution and extent of contamination in OU2 sediment. The goal of the TarGOST™ survey was to delineate the extent of sediment affected by coal tar with sufficient resolution to support remedial decision making.

2.2.1 TarGOST™ Survey

This section briefly describes the TarGOST™ technology and summarizes the scope of the TarGOST™ survey for OU2.

TarGOST™ Technology

The TarGOST™ LIF instrument, developed by Dakota Technologies, Inc. (DTI), is a laser-based technology that utilizes light energy in the form of a green PSX-100 Excimer Laser™ to energize and excite hydrocarbon-based chemicals, causing them to fluoresce and emit light. The specific wavelength of the green Excimer laser (532 nanometers) was selected by DTI for its unique characteristic of causing coal tar and creosote-range hydrocarbons to fluoresce and emit a characteristic wavelength of light that is detected by the probe tip optical assembly.

The TarGOST™ LIF instrument was introduced into subsurface sediments using a Geoprobe® drill rig mounted on a barge outfitted with standard hollow steel drill rods and a specially-designed TarGOST™ probe point that houses an optical assembly for the laser. A laser generator and control box are housed on-board the drill rig, and laser light is transmitted down the hollow drill rod to the optical assembly probe point through a flexible fiber optic cable. A very fast (10-nanosecond) pulse of laser light is emitted from the probe point into the adjacent sediment. If coal tar hydrocarbons are present in the sediment, the energy from the laser is absorbed by the tar and returned as fluorescent light at a characteristic wavelength. The fluorescent light is captured by the optical assembly in the probe tip and is reflected by mirrors back to the surface through the fiber optic cable. A spectrometer and oscilloscope housed on the drill rig evaluate the reflected fluorescent light and transmit a graphical "waveform" describing the characteristics of the fluorescent light to a computer. The wavelength and intensity of the fluorescence is reported as a percent relative to a reference emitter (RE) that is used to calibrate the device prior to each deployment, and a calibrated strip log of the TarGOST™ results is produced. The entire process occurs virtually instantly (under 20 nanoseconds), which allows for continuous, real time, semi-quantitative evaluation of coal tar presence.

DTI's TarGOST™ Users Guide is provided in Appendix B-1. Important points discussed in the Users Guide that influence the interpretation of the OU2 data include the following:

- TarGOST™ detects free-phase and residual non-aqueous phase liquid (NAPL), but does not respond to polynuclear aromatic hydrocarbons (PAHs) that are adsorbed to organic material in the sediment matrix. Therefore, PAH concentrations measured in sediment samples are not expected to correlate with TarGOST™ results.
- The degree of the TarGOST™ response depends on the coal tar or creosote NAPL characteristics. NAPLs from the same site can exhibit different responses as a result of variable subsurface conditions in which the NAPL has resided for what may be long periods of time.
- The TarGOST™ response is site-specific and product-specific; therefore, it can be difficult to directly compare data sets collected at different times in different settings.
- There is no specified percent RE (%RE) that represents the threshold above which NAPL is present. This threshold must be determined on a site-specific and survey-specific

basis, taking into consideration the TarGOST™ results and visual observations of coal tar.

These considerations were taken into account in the TarGOST™ data interpretation presented in Section 3.2.

TarGOST™ Survey Scope

TarGOST™ sampling locations for OU2 are shown in Figure 2-1. A systematic grid sampling approach was employed, as follows:

- In the nearshore area (referred to as Area A), TarGOST™ profiles were collected on an approximate 100-foot grid spacing; 43 out of the proposed 47 grid locations were profiled to a target depth of 50 feet below sediment surface (bss). Four locations (A-3, A-4, A-5, and A-9) were not profiled because the presence of a dilapidated pier and pilings prevented barge access.

- TarGOST™ profiles were also obtained at the 10 locations where Rapid Optical Screen Tool (ROST™) profiles were previously collected to allow for comparison to historical data (GeoSyntec, 2000).

Some of the locations could not be drilled to the specified depth of 50 feet bss due to refusal. If refusal was encountered, the location was moved slightly and a second attempt was made to drill to the specified depth. Table 2-1 summarizes the field collection information for the TarGOST™ survey. The results of the TarGOST™ survey are presented in Section 3.2.

2.2.2 Confirmatory Sampling

Confirmatory sediment samples were not collected concurrently with the implementation of the TarGOST™ system; instead, they were collected from the same locations at a later date using the Geoprobe® and a Macro-Core® sampler. The confirmatory samples were collected from a range of locations and depth intervals to represent a range of %RE values measured in the TarGOST™ profiles and to verify and validate the TarGOST™ results. The sediment cores from the targeted interval were collected from the acetate sleeve in the Macro-Core® sampler, laid out on a core stand, and characterized using standard soil logging procedures. The presence or absence of coal tar or NAPL was noted on the field logs. Sediment was collected from the targeted interval using a stainless steel spoon, homogenized, and placed in sample jars provided by the laboratory.

Table 2-2 lists the confirmatory samples submitted to the laboratory for chemical analysis. Fifteen confirmatory sediment samples were collected from 12 TarGOST™ locations and analyzed for SVOCs, PCB Aroclors, and inorganic constituents (arsenic, chromium, lead, copper, nickel, silver, and zinc). Six of the 15 samples were also analyzed for mercury. Four of the confirmatory samples were submitted to the laboratory for PAH fingerprinting analysis (Section 2.3.4). Two of the samples were inadvertently submitted to the laboratory for analysis of VOCs.

2.3 Surface Sediment Sampling

Surface sediment samples (0-0.5 feet) were collected using a Ponar® dredge sampler and analyzed to characterize the lateral distribution and extent of PCOIs in Hudson River sediment. Surface sediment samples were collected from OU2, the area north of the former gypsum landfill (referred to as the North Area), and locations upriver and downriver of the Quanta Resources property. A summary of the surface sediment samples collected and analyses performed is provided in Table 2-3. Surface sediment sample locations are shown in Figures 2-2 and 2-3. The scope of the surface sediment sampling effort is described further below, and results are presented in Section 3.3.

2.3.1 OU2 Samples

Surface sediment samples were collected from OU2 using a stratified systematic grid sampling design, with two sampling areas defined as Area A and Area B (Table 2-3). Within Area A, samples were collected on an approximate 100-foot grid from 46 locations. Within Area B, samples were collected on an approximate 150-foot grid from 27 locations. All surface sediment samples from Areas A and B were analyzed for SVOCs, PCB Aroclors, and inorganic constituents (arsenic, chromium, lead, copper, nickel, silver, and zinc). Selected samples were analyzed for PCB congeners to support risk assessment activities. The majority of the samples were also analyzed for mercury, grain size distribution, and total organic carbon (TOC). VOCs were analyzed in samples from Area A. Samples from one location in Area B were also inadvertently submitted for analysis of VOCs.

2.3.2 North Area Samples

Elevated levels of PAHs and arsenic were previously measured in samples collected from the embayment north of the former gypsum landfill (North Area) (GeoSyntec, 2000). Five surface sediment samples were collected from this area and analyzed for SVOCs, PCB Aroclors, and inorganic constituents (arsenic, chromium, lead, copper, nickel, silver, and zinc). One sample from the North Area was also inadvertently submitted for analysis of VOCs. Three of the five samples were also analyzed for grain size distribution. One of the five samples was analyzed for mercury and TOC.

2.3.3 Upriver and Downriver Samples

Surface sediment samples were collected at locations upstream and downstream of the Quanta Resources property from similar nearshore areas. Twenty samples were collected in total (10 upstream and 10 downstream). These surface sediment samples were analyzed for SVOCs, PCB Aroclors, inorganic constituents (arsenic, chromium, lead, copper, nickel, silver, and zinc), and grain size distribution. The majority of samples were analyzed for mercury and TOC. The results for these samples were used to investigate regional background conditions.

2.3.4 Chemical Fingerprinting Samples

PAH fingerprinting analyses were performed on a subset of surface sediment samples to support the PAH chemical fingerprinting study. The sample set included six samples from Area A, three from Area B, one from the North Area, five downstream samples, and seven upstream samples (Tables 3-2a and 3-2b). Four additional surface sediment samples (three additional upstream locations and one upstream location across the river) were collected for PAH fingerprinting analysis only (i.e., no other chemical analysis was performed on these samples). The chemical fingerprinting study results are summarized in Section 3.5.

2.4 Subsurface Sediment Samples

Sediment cores were collected using vibracore methodology. Thirty-foot clean, disposable, soft polyethylene liners were used to collect sediment cores for chemical analysis. Fifteen-foot clean, disposable, hard polycarbonate liners were used to collect cores for geotechnical and geochronology sample analysis. Vibracore barrels and cores were set up on the barge deck and then raised and lowered into and out of the river using a crane. A sediment core catcher was installed at the bottom of the sediment core to prevent sediment loss from the bottom of the core while being raised out of the river onto the deck of the barge.

A total of 14 chemical analysis cores, 2 geotechnical cores, and 3 geochronology cores were collected. Sediment core sample locations are shown in Figure 2-2, and a subsurface sample summary is provided in Table 2-4.

2.4.1 Cores for Chemical Analysis

Sediment cores for chemical analysis were collected using a 30-foot flexible polyethylene liner from 14 locations (8 from Area A, 5 from Area B, and 1 from the North Area). Sediment cores for chemical analysis were collected to a depth of 30 feet bss. Little to no sediment was observed to be lost during core retrieval. Because of sediment compaction, the length of the sediment cores recovered ranged from approximately 20 to 25 feet.

Vibracore collection and sample processing took place on the deck of the work boat. Upon retrieval, each core was removed from the core barrel and laid out in a PVC half-pipe while still contained within the polyethylene liner. The thin, transparent core liner was then cut open with a utility knife. The “smear zone” (sediment that was in contact with the core liner) was scraped off the core using a clean wooden spatula and discarded. A tape measure was laid out alongside the core to measure off sample intervals.

As specified by the Work Plan, selected sediment core intervals were analyzed for VOCs, SVOCs, PCB Aroclors, PCB congeners, metals, mercury, TOC, and grain size, depending on sample location and depth. Remaining core intervals were processed and archived at the laboratory for potential future analysis. A summary of the subsurface sediment samples that were collected is provided in Table 2-4. Where required, the VOC sample was collected first by inserting the Encore® sample vial directly into the sediment. After the VOC sample was collected, the rest of the core sections were processed. For each core section, the sediment was collected from the interior of the core using a clean stainless steel spoon and placed in a disposable aluminum pan. The sample was then homogenized by mixing the sediment until a uniform color and texture were achieved, and placed into the appropriate sample jars that were provided by the laboratory. Sediment core logging was conducted during and after sample processing. The description of the sediment core was recorded on a field log sheet. Sediment core logs are provided in Appendix C. Subsurface sediment sample results are presented in Section 3.4.

2.4.2 Cores for Geochronology Analysis

Sediment cores for geochronology analysis were collected from three sample locations (A-24, A-44, and B-16) using a 15-foot rigid polycarbonate liner. The geochronology cores showed evidence of shortening, ranging from 0.5 feet to 1 foot. After transport to shore, each core was anchored to the wall of the trailer in a vertical position using a specially constructed core stand. The core was measure, and 2-inch sample intervals were marked on the outside of the core liner with a permanent marker. The core was then cut into 1-foot sections (starting at the sediment surface) and extruded. Each 2-inch section was transferred into a separate disposable aluminum pan using a clean wooden spatula. The spatula was used to scrape off sample material that had been in contact with the core liner (the "smear zone"). Next, the sample jars were filled with the sediment that remained after the "smear zone" had been removed.

Initially, only the top 2-inch section per foot of each core was submitted for analysis of cesium-137. Additional samples were selected for analysis after the initial cesium-137 core profiles were obtained. A summary of the sediment samples submitted for geochronology analysis (cesium-137) is provided in Table 2-5. Geochronology results are discussed in Section 3.6.

2.4.3 Cores for Physical Analysis

Sediment cores for geotechnical analysis were collected from two locations (A-12 and A-42) using a 15-foot rigid polycarbonate liner. At Station A-42, the core barrel penetrated to a depth of 15 feet, and 14 feet of sediment were recovered. At Station SD-A-12, the core barrel penetrated to a depth of 19 feet, and 15 feet of sediment were recovered. After collection, each sediment core was cut into three separate sections for geotechnical analysis. Clean plastic caps were sealed onto the open ends of the cores. These hard liners were stored vertically throughout the sampling process before being transported to shore in a vertical position for delivery to the geotechnical laboratory. A summary of the sediment samples submitted for geotechnical analysis is presented in Table 2-6. Geotechnical sample results are summarized in Section 3.7.

2.5 Laboratory Analyses and Data Verification

Sediment samples were sent to Accutest Laboratories, Dayton, New Jersey; Alta Analytical, Sacramento, California; and Flett Research, Ltd., Winnipeg, Canada. Accutest subcontracted French & Parrello, Wall, New Jersey, to perform various geotechnical analyses. Quality assurance /quality control (QA/QC) review of the analytical data was performed in accordance with EPA national functional guidelines for data validation (EPA, 1999 and 2004), and EPA SW-846 methodology. Data validation was not performed on geotechnical or geochronology data.

QC criteria that were evaluated for all samples include the following, as appropriate for each analytical method: laboratory blanks, field blanks, field duplicates, laboratory duplicates, laboratory control samples, matrix spikes and matrix spike duplicates, initial and continuing calibrations, instrument tuning, internal standards, surrogates, confirmation, degradation, holding times, and sample preservation. Data were qualified noting any QC exceedances. An overall evaluation of the data indicates that the sample handling, shipment, and analytical procedures were adequately completed, and that the analytical results should be considered accurate. The analytical data had minor QC concerns; however, these did not affect data usability for the affected results. The validation review demonstrated that the analytical systems were generally in control and the data results can be used in the decision making process.

2.6 Deviations from the Work Plan

This section summarizes problems encountered in the field and differences between planned and actual sampling activities. Deviations from the Work Plan were as follows:

- The sampling barge was able to maneuver into the shallow areas near the bulkhead at high tide, but the tide would only allow a brief window of time for work before the area became too shallow for sampling. Some of the sample locations were abandoned or not drilled to the specified depth because of this problem.
- The initial geophysical surveys revealed that some submerged obstructions prevented barge access. These submerged obstructions prevented the collection of samples at Station B-30. Samples were not collected at Station A-5 because of its location near the collapsed pier.
- During the TarGOST™ survey, four locations (A-6, A-7, A-10, and A-11) could not be drilled to the specified 50 feet bss because of refusal (Table 2-1). Some locations near the collapsed pier area could not be accessed by the barge. TarGOST™ profiles were not collected from Stations A-3, A-4, A-5, and A-9 because of lack of barge access.
- During the surface sediment grab sampling, two of the locations (Stations B-25 and B-26) were not sampled because of a strong current and steep slope. Several attempts were made before abandoning these locations.
- Two chain-of-custody errors precluded or included sample analyses that were not specified in the Work Plan. VOCs were inadvertently analyzed in some Area B samples, one North Area sample, and two TarGOST™ confirmatory samples; and mercury and TOC analyses were omitted for a subset of samples.
- Bulk density, consolidation, permeability, and shear strength were not analyzed because of concerns about potential changes in these geotechnical properties in subsurface sediment resulting from the vibracore sample collection method. Additionally, column settling tests were not performed. These geotechnical tests will be performed as part of the remedial design phase for OU2 as appropriate.

SECTION 3

Results

The results of the OU2 field and laboratory activities described in Section 2 are presented below.

3.1 Geophysical Surveys

A bathymetric survey was performed to measure the current sediment surface elevation in OU2. The results of the bathymetric survey are provided in Figure 3-1. The majority of the OU2 study area was less than 10 feet deep. The primary goal of the geophysical survey was to perform a utility clearance and subsurface survey of the study area before collecting sediment samples. As part of the investigation, targets that may be potential hazards to future operations in the study area were described. These targets are briefly described below. The complete survey report is provided in Appendix A.

The side-scan sonar detected six targets during the survey. Two targets are submerged wrecks. One target is most likely the remains of a mooring dolphin. The other targets are most likely associated with structures related to the conveyor remains in the northeastern end of the survey area near the former gypsum landfill. There are structures extending west from the exposed pilings from the old conveyor structure. They come off of every third or fourth set of pilings and extend out about 15 feet.

The magnetic survey was conducted to detect submerged utilities as well as exposed and buried ferrous objects within the survey area. The magnetometer survey identified 22 magnetic anomalies. Of those, two were associated with the side-scan sonar targets described above. Two targets have signatures indicative of clusters of buried targets. They are most likely associated with the remains of a removed/collapsed pier as depicted on the navigational chart. Many of the shallow and smaller targets likely represent anchors used to secure the boom that contains the sheen in the near shore area. None of the magnetic anomalies were found to have signatures indicative of a potentially significant submerged cultural resource.

A sub-bottom profiling survey was conducted to identify submerged utilities, subsurface sediment stratification, and to possibly locate objects that could pose a problem for future operations. The sub-bottom profiling was unsuccessful in terms of its ability to detect buried debris or generate geologic cross-sections of the sub-bottom sediments or bedrock. The principal limiting factors to the quality of the sub-bottom data were the presence of organic, gaseous, materials in the shallow sub-bottom, the relatively shallow water depths, and the similar nature of the sub-bottom sediments in the survey area.

3.2 Extent of Sediment Affected by Coal Tar

The distribution and extent of sediment affected by coal tar was characterized by first determining the TarGOST™ response (%RE) that represents the threshold above which coal tar appears to be present, and then mapping the horizontal and vertical distribution of sediment with TarGOST™ responses exceeding the threshold value.

3.2.1 TarGOST Results

Appendix B-2 presents the TarGOST™ logs obtained at each survey location. The TarGOST™ technology generates a color-coded, scaled graphical log for each boring location. The vertical axis of the graph corresponds to the depth below the sediment surface, and the horizontal axis quantifies the relative fluorescence observed in the sediment. The data are presented as %RE. Profiles of three signals are portrayed on the logs: the scatter signal (background signal from the sediment matrix that gives an indication of the reflectivity of the sediment), the fluorescence signal (representing the signal from the NAPL), and a normalized signal that is derived by dividing the fluorescence signal by the scatter signal. This correction is important in high fluorescence response environments where a wide range of fluorescence response is observed (e.g., OU1 upland soils). However, the OU2 sediments had an elevated scatter signal and relatively low fluorescence signal because of the Site-specific properties of the sediment matrix and coal tar. Therefore, at the direction of DTI, the non-normalized fluorescence signal was used to interpret the TarGOST™ data from OU2. The fluorescence signal is portrayed on the right hand side of each log.

3.2.2 Field Observations

Where observed in confirmatory samples and the vibracores, coal tar occurred in pockets, lenses, and thin laminae in clayey silt sediment. This is consistent with observations made during the previous ROST™ investigation (GeoSyntec, 2000).

3.2.3 Determination of Coal Tar TarGOST Response Threshold

Non-normalized TarGOST™ fluorescence response data, visual observations for core intervals from which confirmatory samples were collected, and visual observations from vibracores collected at the same location were evaluated to determine the threshold %RE above which the presence of coal tar was considered to be likely. Table 3-1 summarizes this information for each of the survey locations. At 18 of the 53 locations, confirmatory sample and/or vibracore observations were available for comparison to TarGOST™ results. Boring logs for these locations were reviewed to identify the depth interval(s) at which the presence of NAPL was noted (the depth intervals associated with the vibracore data have a greater degree of uncertainty because of core compaction during collection). The corresponding TarGOST™ logs for each of the 18 locations were reviewed for %RE fluorescence within intervals where NAPL was observed, and the distribution and intensity of the various fluorescence channel responses[1] (waveform graphs) within and adjacent to those intervals. The correlation between visual observations and TarGOST™ responses known to be indicative of coal tar PAH fluorescence (based on waveforms and the combined fluorescence response) was classified as GOOD, FAIR, or POOR, as follows, for each location-depth interval combination:

[1] The color of the TarGOST response graph is a summation of the fluorescence response frequencies and used with the resultant wave forms will provide an indication of the presence of coal tar versus other chemicals that might also fluorescence (Appendix B-2, TarGOST Users Guide).

- GOOD – Depth intervals where the TarGOST™ indicators and confirmatory sample visual observations agreed on either the presence or absence of coal tar.
- FAIR – Depth intervals where the TarGOST™ indicators and the collocated visual observations agreed on either the presence or absence of coal tar at nearby depth interval(s). Observations from vibracore depth intervals were included in this category because compaction during sediment core collection introduced uncertainty into the depth correlation.
- POOR – Depth intervals where the TarGOST™ indicators and the collocated visual observations disagreed on either the presence or absence of coal tar. Depth intervals where TarGOST™ indicated the presence of NAPL but the collocated visual observations did not were classified as false positives. Depth intervals where the collocated visual observations indicated the presence of NAPL but the TarGOST™ indicators did not were classified as a false negatives.

The %RE fluorescence values were then reviewed for locations with GOOD or FAIR correlations that indicated the presence of NAPL. The lowest %RE fluorescence value associated with the presence of coal tar was 6.7%RE[2], which was determined to be the threshold %RE value for this survey.

False Positives

Two false positives (out of 15 confirmatory samples, or 13.3%) were observed between the TarGOST™ results and visual observations, as follows:

- Location A-14: at the depth interval 57-58 feet bss, the TarGOST™ maximum response was 16.67%RE fluorescence, but no coal tar was observed in the confirmatory sample. The total PAH concentration in the confirmatory sample was 199 milligrams per kilogram (mg/kg), which is within the range of concentrations measured in other confirmatory samples where no coal tar was observed (Table 3-1).
- Location A-20: at the depth interval 44-45 feet bss, the TarGOST™ maximum response was 66.05%RE fluorescence, but no coal tar was observed in the confirmatory sample. The total PAH concentration in the confirmatory sample was 61 mg/kg, which is within the range of concentrations measured in other confirmatory samples where no coal tar was observed (Table 3-1).

False Negatives

Four false negatives (out of 15 confirmatory samples, or 26.7%) were observed between the TarGOST™ results and visual observations, as follows:

- Location R-01: at depth interval 42.5-43.5 feet bss, coal tar was observed in the confirmatory sample in centimeter-scale lenses, with an obvious coal tar odor. The TarGOST™ response at that depth interval was 3.19%RE fluorescence. The total PAH concentration in the confirmatory sample was 1167 mg/kg, which is at the

[2] This threshold response is considerably lower than that determined for OU1 soils. PAH fluorescence was considerably lower in the OU2 sediment than in the OU1 soils. The Users Guide (Appendix B-1) discusses several factors that may be responsible for this difference, including differences in the subsurface environment in which the coal tar exists, and lack of comparability of data sets collected at different times in different settings.

lower end of the range of concentrations in confirmatory samples where coal tar was observed (Table 3-1).

- Location A-17: at depth interval 14-21 feet bss in the vibracore, coal tar was observed in millimeter- to centimeter-scale lenses, with an obvious coal tar odor. The TarGOST™ response at that depth interval was 4.26%RE fluorescence.
- Location A-26: at depth interval 14-18 feet bss in the vibracore, coal tar was observed in millimeter- to centimeter-scale lenses, with an obvious coal tar odor. The TarGOST™ response at that depth interval was 2.09%RE fluorescence.
- Location A-46: at depth interval 8-10 feet bss in the vibracore, coal tar was observed in millimeter- to centimeter-scale lenses, with an obvious coal tar odor. The TarGOST™ response at that depth interval was 2.03%RE fluorescence.

There are several possible explanations for discrepancies between TarGOST™ responses and visual observations of coal tar in sediment. Although the TarGOST™ profile, confirmatory samples, and vibracores were taken at the same location, they were collected from three separate borings on separate days. Therefore, the differences may represent spatial variability. Three of the four false negative results are based on the comparison of the TarGOST™ response to visual observations from the vibracore collected at the same station; however, the vibracores showed evidence of compaction (shortening), and specific depth intervals noted in the vibracore boring log may not correspond to *in situ* conditions.

3.2.4 Lateral and Vertical Distribution and Extent of Sediment Affected by Coal Tar

The threshold value of 6.7%RE was used to identify the horizontal and vertical extent of sediment that is likely to contain coal tar. The goal of this evaluation is to identify the extent of coal tar with sufficient resolution for remedial decision making. The information on coal tar distribution and extent will be combined with analytical results for surface and subsurface sediment to delineate areas for evaluation in the FS.

The maximum TarGOST™ response from each OU2 survey location was plotted in plan view and contoured using a kriging method to provide an estimate of the horizontal extent of coal tar and to identify areas with the highest levels of coal tar impacts. OU1 survey data were also included on the map to provide an initial indication of relationships between the occurrence of coal tar in OU1 and OU2. Figure 3-2 presents the lateral extent of coal tar based on the maximum TarGOST™ results (%RE fluorescence). Sediment affected by coal tar appears to occur in the embayment to a distance of approximately 300 feet in sediment east of the shoreline. The area near the shoreline in the vicinity of the dilapidated timber pilings and pier at 115 River Road could not be surveyed because of lack of barge access; however, the presence of coal tar in sediment in this area is suspected. Figure 3-3 presents two interpretive cross-sections of coal tar in OU1 and OU2. These figures indicate that affected sediments occur at depth in OU2, and are not connected to, or contiguous with, soils affected by coal tar at OU1.

3.2.5 Comparison of TarGOST™ and Historic ROST™ Results

An earlier LIF technology, ROST™, was employed at the Site in November 1998 to characterize petroleum and coal tar deposits in soils and sediments. Ten LIF profiles were obtained from the Hudson River sediments to depths of 55 to 60 feet bss (Appendix B-3). TarGOST™ profiles were obtained from the same ROST™ locations in the Hudson River sediment to compare the results of the two technologies and refine the previous interpretation of coal tar distribution and extent (GeoSyntec, 2000).

The ROST™ LIF technology also uses the fluorescent characteristic of petroleum hydrocarbons to delineate the vertical and horizontal extent of contaminated soils or sediments. Several characteristics of the emitted fluorescence are measured and recorded simultaneously at four specific wavelengths (340, 390, 440, and 490 nanometers). These four wavelengths represent the spectrum of fluorescence typically produced by aromatic hydrocarbons, ranging from light fuels to heavy contaminants such as coal tar and creosote.

Appendix B-3 presents the comparison of the more advanced, coal tar-specific TarGOST™ and the older petroleum/coal tar ROST™ LIF survey profile logs and field observations. These comparisons generally indicate the following:

- ROST™ overestimated the thickness and lateral extent of coal tar in OU2 sediments. The thicknesses of affected sediment layers interpreted from the TarGOST™ logs and the millimeter- to centimeter-scale lenses visually observed during TarGOST™ confirmatory sampling and vibracoring do not confirm the thicker layer of affected sediment interpreted by GeoSyntec (2000) (e.g., CPT-R1 comparison).
- "Heavy-end Product" interpreted by GeoSyntec (2000) from the ROST™ logs for locations CPT-R2 (Area B) and CPT-R5 (Area A) is not coal-tar-related based on the TarGOST™ results and does not appear to be Site-related.

A more-detailed comparison of the ROST™ and TarGOST™ survey results will be presented in the OU2 RI report as part of the discussion of the nature and extent of contamination.

3.2.6 Comparison of TarGOST™ Results and Sediment Analytical Data

At 12 of the TarGOST™ locations, confirmatory samples were analyzed for PAHs and other PCOIs. The total PAH concentrations in sediment were compared with the corresponding %RE fluorescence values to test for a possible linear correlation (Appendix B-4). Total PAH concentrations in sediment are not correlated with %RE (R^2 <0.2); however, as noted in Section 2.2, TarGOST™ does not measure PAHs that are adsorbed to organic particles in sediment and a linear correlation would not be expected. In the confirmatory samples, the highest total PAH concentration measured in a sample where no coal tar was observed was 370 mg/kg, and the lowest total PAH concentration measured in a sample where coal tar was observed was 1,096 mg/kg (Table 3-1).

3.3 Surface Sediment Sample Results

The analytical results for surface sediment samples (0-0.5 feet) were statistically evaluated to summarize PCOI concentrations in OU2 and identify potential Site-related PCOIs. In addition, the spatial distribution of selected PCOIs was mapped, and results from the 2006 sampling effort were qualitatively compared with previous OU2 sampling results. Complete analytical results for surface sediment samples collected in 2006 are provided in Appendix D.

3.3.1 Statistical Analysis of Surface Sediment Sample Results

Summary statistics were calculated for surface sediment samples from Areas A and B at OU2. The frequency of detection, ranges of detected values and detection limits, and the locations of the maximum detected value, mean, and standard deviation for each PCOI are provided in Table 3-2. The most frequently detected PCOIs (i.e., detected in more than 50 percent of the Area A and Area B samples) are inorganic constituents (arsenic, chromium, copper, lead, nickel, zinc, and mercury), PCBs (Aroclor 1242 and Aroclor 1254), PAHs, bis(2-ethylhexyl)phthalate, and carbazole (methyl acetate was also detected in more than 50% of the samples, but the majority of values were flagged as estimated concentrations).

Concentrations of the frequently detected constituents in surface sediment samples from the following five areas were statistically compared to identify potential differences in median concentrations:

- Area A (46 samples)
- Area B (27 samples)
- North Area (i.e., area north of the former gypsum landfill) (5 samples)
- Upriver (10 samples)
- Downriver (10 samples)

The analysis was performed using the non-parametric Kruskal-Wallis test, which compares more than two subsets of samples and does not assume that data are normally distributed. If the probability of the test statistic was less than 0.05, then it was concluded that the null hypothesis (sample groups are not significantly different) cannot be supported. In cases where differences were found, results were further analyzed to define which sample groups had higher constituent concentrations.

Table 3-3 summarizes the results of the comparisons. Chromium, nickel, and silver were found at significantly higher concentrations in upriver samples than in samples from all other areas. Arsenic was significantly higher in the North Area sample group. Total PAHs (including total high molecular weight and low molecular weight PAHs) were significantly higher in Area A samples, and higher in North Area, Area B, and downriver samples relative to upriver samples. Copper, lead, zinc, mercury, and total PCB concentrations were not significantly different within the five sample groups. Box plots showing the distribution of PCOI concentrations of all frequently detected compounds in the five sample groups are provided in Appendix E.

This analysis indicates that PAHs and arsenic are the primary PCOIs that are present at higher concentrations in surface sediment in and near OU2 relative to upriver and downriver locations. Figure 3-4 shows concentrations of total PAHs and total PCBs in surface sediment with latitude (river mile), from the northernmost upriver station to the southernmost downriver station. Total PAH concentrations are clearly higher in the vicinity of OU2, whereas PCB concentrations are not. Figure 3-5 shows arsenic and lead in surface sediment with river mile; in this case, elevated arsenic concentrations are apparent in samples in and near OU2, whereas lead appears to be elevated in only one sample (although arsenic concentrations are not significantly higher in Area A or Area B samples as a group, they were elevated in several individual samples). The areal and vertical distribution and extent of PAHs and arsenic in sediment are described further below.

3.3.2 Areal Distribution and Extent of PAHs

Figure 3-6 is a box plot of total PAH concentrations in surface sediment from the five areas identified above. The highest PAH concentrations are clearly found in the Area A sediment samples relative to the other sample groups. Figure 3-7 is a map of total PAH concentrations in surface sediment measured in and near OU2 in 2006. Total PAH concentrations of greater than 100 mg/kg are found along the shoreline immediately east of the Quanta property, and extending to the south under 115 River Road and to the north for a short distance. Total PAH concentrations decrease with increasing distance from the shoreline, to concentrations of <10 mg/kg approximately 300 feet offshore.

Figure 3-8 is a map of total PAH concentrations in surface sediment based on all samples collected between 1995 and 2006. This map provides an initial assessment of consistency of 2006 results with historic measurements, although data comparability was not assessed. With the exception of the North Area, the distribution of PAHs based on this data set is similar to the distribution based on 2006 data alone, which indicates that the results are broadly consistent. PAH concentrations in the North Area surface sediment appear to be higher based on the 1995-2006 data set compared to the 2006 data set alone. The top panel of Figure 3-9 is a scatter plot of the 1995-2000 total PAH surface sediment results compared to the 2006 results; this plot confirms that the measurements are comparable except in the North Area, where the historical measurements were higher. The reasons for the differences in this area are not clear.

3.3.3 Areal Distribution and Extent of Arsenic

Figure 3-10 is a box plot of arsenic concentrations in surface sediment from the five sample areas. The highest arsenic concentrations in surface sediment are found in the North Area samples, and at several locations in Area A and Area B. As described above, arsenic concentrations in Area A and Area B sample groups were not significantly higher than upstream or downstream sample groups, even though concentrations were elevated in several individual samples. Figure 3-11 is a map of arsenic concentrations in surface sediment measured in and near OU2 in 2006. Arsenic concentrations greater than 50 mg/kg are found in the southwest corner of the North Area, immediately east of the former gypsum landfill in Area B, and along the shoreline south of 115 River Road in Area A. Arsenic concentrations in OU2 river sediment east of the Quanta Resources property are less than 25 mg/kg.

Figure 3-12 is a map of arsenic concentrations in surface sediment based on all samples collected between 1995 and 2006. As with PAHs, this map provides an initial assessment of consistency between historic and recent measurements, although data comparability was not evaluated. The distribution of arsenic based on this data set is similar to the distribution based on 2006 data alone, except in the North Area. Arsenic concentrations in the North Area surface sediment are higher based on the 1995-2006 data set compared to the 2006 data set alone. The bottom panel of Figure 3-9 is a scatter plot of the 1995-2000 arsenic surface sediment results compared to the 2006 results. This plot confirms that the arsenic measurements are comparable except in the North Area, where the historical measurements were higher. As with PAHs, the reasons for the differences in this area are not clear.

3.4 Subsurface Sediment Sample Results

The analytical results for PAHs and arsenic in subsurface sediment samples were evaluated to characterize the vertical distribution and extent of these parameters. Complete analytical results for the subsurface samples collected in 2006 are provided in Appendix D.

3.4.1 Vertical Distribution and Extent of PAHs

Depth profiles of total PAH concentrations in OU2 sediment are presented in Figure 3-13. In general, PAH concentrations are higher in subsurface sediments than in surface sediments, and higher in Area A cores than in Area B cores. However, the concentration profiles vary from core to core. In some locations, total PAH concentrations decrease to less than 1 mg/kg at the bottom of the core (e.g., A-17, A-44); at other locations, concentrations show an increasing trend and are greater than 100 mg/kg at the bottom of the core (e.g. A-12, A-24). The highest subsurface PAH concentration of approximately 11,000 mg/kg was measured in the 16- to 18-foot sample from Station A-24.

3.4.2 Vertical Distribution and Extent of Arsenic

Depth profiles of arsenic concentrations in OU2 sediment are presented in Figure 3-14. Arsenic concentrations are generally higher in subsurface sediments than in surface sediments, and higher at specific depths and locations in Area A (e.g. multiple depths in A-17, 12-18 feet bss at A-24, 12-14 feet bss at A-44, and 8-10 feet bss at A-46). Concentration profiles vary from core to core, although in many locations concentrations gradually increase with increasing depth (e.g. A-12, B-03).

3.4.3 Upriver Sample Results

Point estimates of PCOI concentrations in upriver samples were calculated to provide an indication of regional background concentrations. The statistical comparisons of the five sample groups presented in Section 3.3.1 indicated that concentrations of PAHs in downriver samples were higher than those in upriver samples; therefore, the results for the upriver and downriver sample groups were not combined to obtain estimates of regional background concentrations. Table 3-4 presents the 50th percentile (mean or median, depending on distribution of data), 95th percentile, and 95 percent upper confidence limit on the 50th and 95th percentiles. Table 3-5 provides a comparison of the 50th percentile results for total PAHs and arsenic with results for samples collected from the Hudson River between the George Washington Bridge and New York Harbor as part of the New York/New Jersey Harbor Estuary Program and National Oceanic and Atmospheric Administration National Status and Trends Program. Although the numbers for these program samples are small, they are consistent with the 2006 upriver samples collected for the OU2 investigation.

3.5 Chemical Fingerprinting Study Results

A chemical fingerprinting study was conducted as part of the OU2 RI to evaluate potential impacts of Site-related coal tar in Hudson River sediment in the vicinity of the Quanta Resources property. The fingerprinting study report is provided in Appendix F and summarized below.

Samples were collected from OU1 (coal tar product), Area A and Area B in OU2, and from multiple locations in the Hudson River, from about 4.5 miles upstream of the Site to about 4 miles downstream of the Site. One sheen sample near the bulkhead in OU2 and four subsurface sediment samples from OU2 were also included in the analysis. These samples were analyzed for a full suite of chemical fingerprinting parameters, including parent and alkylated PAHs, biomarkers (steranes and triterpanes), saturated hydrocarbons, and total petroleum hydrocarbons (TPH).

Sample results were evaluated using multiple data analysis techniques, including qualitative review of TPH chromatograms, biomarker extracted ion current profiles, and PAH histograms; evaluation of key diagnostic parameters using line graphs, double ratio plots, and a chemical mixing model; and statistical analyses such as principal component analysis and Fingerprint Analysis of Leachate Contaminants (FALCON) (Plumb, 2004) analysis.

Multiple lines of evidence were used to develop conclusions about PAH sources to Hudson River sediments, and potential Site-related impacts from coal tar. Overall, the results of the chemical fingerprinting analyses indicated the presence of a substantial hydrocarbon background signature in Hudson River sediments. The background signature comprises a mixture of pyrogenic (combustion-related), petrogenic (petroleum-related), and biogenic (naturally occurring) PAHs. Samples collected immediately adjacent to the Quanta Resources property (Area A samples and subsurface sediment samples) show evidence of Site-related coal tar impacts. The upstream, across river, and Area B samples had a background signature and no evidence of Site-related coal tar. Samples from two of the upriver stations had elevated levels of petroleum hydrocarbons that were not related to the Quanta Resources property. Samples from three downstream stations had a mixture of background hydrocarbons and low levels of coal tar or creosote. However, the source relationships in these samples were not obvious, and other potential (non-Site-related) sources of pyrogenic PAHs located downstream of the Quanta Resources property would need to be identified and characterized to address this uncertainty.

3.6 Geochronology Results

Cesium-137 was measured in samples from three sediment cores, two from Area A and one from Area B. The cesium-137 profiles were evaluated to estimate the net sediment accumulation rate and degree of post-depositional mixing in the sediment column. Cesium-137 was present in the fallout from atmospheric nuclear tests, and first appeared in sediment cores around 1952-1955. Deposition of cesium-137 peaked in 1963-1964. In an undisturbed depositional environment, cesium-137 activity levels will reflect cesium-137 releases during the period of atmospheric nuclear testing, with an initial appearance in the early to mid-1950s, a peak in the early 1960s, and a decrease in the early 1970s after atmospheric testing was halted. However, tidal Hudson River sediments are also affected by releases of cesium-137 from the Indian Point nuclear reactor plant, which may result in multiple cesium-137 peaks in sediment cores (Bopp et al., 1982). Therefore, sediment accumulation rates cannot be reliably determined based on identification of peak cesium-137 concentrations, but can be determined based on its first appearance (which correlates to approximately 1954).

Figure 3-15 presents the cesium-137 profiles for the three cores collected from OU2. The net sediment accumulation rates were estimated based on the first appearance of cesium-137. Assuming that this horizon generally corresponds with 1954, the net sediment accumulation rate at A-24 is approximately 3 inches per year (in/yr) at A-44 and B-16, and greater than 3 in/yr in A-24, where cesium-137 was present at detectable levels at the bottom of the core. These high accumulation rates are consistent with measurements from other cores collected in the same part of the Hudson River (Bopp et al., 1982; Klingbeil et al., 2005). The profile in B-16 shows the least amount of disturbance, with a smooth increase in cesium-137 activity to a depth of about 80 inches, and a gradual decrease in activity below this depth. The activity profiles in A-24 and A-44 are more uniform, which indicate reworking/disturbance of the sediment column, possibly by bioturbation, methane gas generation, resuspension, and/or anthropogenic activities such as dredging.

3.7 Geotechnical Results

Sediments in two cores from Area A (Stations A-12 and A-42) were analyzed for water content, specific gravity, organic content, and Atterberg limits. Geotechnical sample results are provided in Appendix G. The sediment samples were classified as dark grey organic silt with a water content ranging from 81 percent to 110 percent. The silts are non-plastic and have a specific gravity of approximately 2.6 and average organic carbon content of about 7 percent.

SECTION 4

Summary

The results of the OU2 RI field investigation provided the following information:

- Characterization of the lateral and vertical distribution and extent of sediment affected by coal tar in OU2 based on TarGOST™ survey results
- PCOI concentrations in surface sediment from OU2, the area north of the former gypsum landfill, and at upriver and downriver locations
- Characterization of the horizontal and vertical distribution and extent of PCOIs in OU2 sediment
- Characterization of sources of PAHs in sediment based on the chemical fingerprinting study
- Characterization of the net sediment accumulation rate and depositional environment in OU2, and geotechnical characteristics of sediment

This information will be used to support the OU2 RI, baseline risk assessments, and FS. Impacts to Hudson River sediment from former industrial activities at the Quanta Resources property have been characterized based on this investigation. Surface water impacts will be characterized as part of the BERA. The nature and extent of coal tar and Site-related PCOIs in OU2 sediment have been characterized, although the extent of coal tar and selected PCOIs may need to be refined in specific areas to support the development of a remedy. Human health and ecological impacts associated with the former industrial processes at the Quanta Resources property will be characterized in the OU2 human health and ecological risk assessments. Sufficient data have been collected to characterize the properties of sediment for the purposes of developing remedial alternatives. Additional geotechnical data will be collected to support remedial design as necessary. The information and data collected in 2006 and to be collected as part of the BERA will be used to develop a refined CSM for OU2.

SECTION 5

References

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Tables

Table 2-1
OU2 TarGOST™ Survey Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Area	Location ID	Sample Date	Easting[1] (feet)	Northing[1] (feet)	Elevation[2] (feet)	Maximum Depth (feet)	Comments
Area A	A-1	11/21/2006	633389.98	717971.01	-0.51	50.08	
Area A	A-2	11/20/2006	633466.45	718093.18	-0.284	50.17	
Area A	A-3	--	--	--	--	--	Location not accessible
Area A	A-4	--	--	--	--	--	Location not accessible
Area A	A-5	--	--	--	--	--	Location not accessible
Area A	A-6	11/30/2006	633657.37	718485.19	-0.26	31.76	Refusal
Area A	A-7	11/28/2006	633692.68	718573.54	-0.124	18.82	Refusal
Area A	A-8	11/29/2006	633746.16	718631.83	-0.338	29.09	Refusal
Area A	A-9	--	--	--	--	--	Location not accessible
Area A	A-10	11/30/2006	633840.9	718609.15	-0.953	41.64	Refusal
Area A	A-11	11/28/2006	633794.98	718519.99	-1.147	42.62	Refusal
Area A	A-12	11/27/2006	633751.91	718428.23	-1.221	46.64	Refusal
Area A	A-13	11/27/2006	633711.59	718336.27	-0.6	50.18	
Area A	A-14	11/30/2006	633674.81	718249.02	-0.219	62.39	
Area A	A-15	11/20/2006	633645.83	718154.85	-0.807	50.1	
Area A	A-16	11/21/2006	633576.67	718058.56	-1.807	50.04	
Area A	A-17	11/21/2006	633484.25	717926.32	-1.871	50.09	
Area A	A-18	11/20/2006	633589.63	717870.67	-2.244	50.03	
Area A	A-19	11/21/2006	633639.38	718009.88	-1.851	50.15	
Area A	A-20	11/27/2006	633709.55	718129.67	-0.637	50.25	
Area A	A-21	11/19/2006	633776.14	718204.1	-0.427	50.11	
Area A	A-22	11/19/2006	633803.03	718282.79	-1.776	53.07	
Area A	A-23	11/19/2006	633850.76	718376.48	-1.601	50.11	
Area A	A-24	11/28/2006	633890.38	718471.15	-1.436	50.17	
Area A	A-25	11/30/2006	633943.38	718559.48	-1.459	50.16	
Area A	A-26	11/29/2006	633986.81	718651.68	-0.86	50.19	
Area A	A-27	11/29/2006	634021.05	718722.49	0	50.09	
Area A	A-28	11/28/2006	634120.49	718668.54	-1.334	50.14	
Area A	A-29	11/28/2006	634086.33	718601.41	-1.893	50.14	
Area A	A-30	11/28/2006	634045.56	718506.41	-1.816	50.23	
Area A	A-31	11/18/2006	633994.97	718413.96	-1.885	50.1	

Table 2-1
OU2 TarGOST™ Survey Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Area	Location ID	Sample Date	Easting[1] (feet)	Northing[1] (feet)	Elevation[2] (feet)	Maximum Depth (feet)	Comments
Area A	A-32	11/18/2006	633954.77	718328.03	-1.872	50.07	
Area A	A-33	11/17/2006	633907.61	718235.19	-1.889	50.12	
Area A	A-34	11/27/2006	633867.83	718157.5	-0.63	50.16	
Area A	A-35	11/27/2006	633802.65	718082.93	-0.94	50.13	
Area A	A-36	11/20/2006	633728.43	717952.68	-2.024	50.12	
Area A	A-37	11/27/2006	633668.79	717832.06	-2.401	50.08	
Area A	A-38	11/21/2006	633822.42	717757.9	-2.708	50.01	
Area A	A-39	11/19/2006	633889.46	717880.76	-2.485	50.12	
Area A	A-40	11/19/2006	633942.68	718010.2	-1.274	50.09	
Area A	A-41	11/16/2006	633956.39	718109.26	-0.626	50.03	
Area A	A-42	11/17/2006	634006.19	718186.51	-2.396	50.13	
Area A	A-43	11/17/2006	634051.04	718272.99	-2.078	50.08	
Area A	A-44	11/18/2006	634093.1	718367.52	-2.154	50.06	
Area A	A-45	11/29/2006	634141.78	718455.67	-1.89	50.19	
Area A	A-46	11/27/2006	634184.64	718544.68	-1.962	50.03	
Area A	A-47	11/28/2006	634221.78	718613.37	-0.691	50.1	
Area B	CPT-R1	11/16/2006	634033.36	718083.85	-2.459	50.06	
Area B	CPT-R2	11/16/2006	634397.05	718004.26	-14.135	49.76	
Area B	CPT-R3	11/16/2006	634559.9	718224.95	-12.887	50.01	
Area B	CPT-R4	11/17/2006	634067.16	717654.2	-7.151	50.09	
Area A	CPT-R5	11/21/2006	633838.09	717870.29	-2.484	50.03	
Area A	CPT-R6	11/20/2006	633587.22	718035.15	-1.604	50.06	
Area A	CPT-R7	11/19/2006	633807.82	718362.4	-1.728	50.11	
Area A	CPT-R8	11/18/2006	633974.71	718281.71	-1.96	50.09	
Area A	CPT-R9	11/18/2006	634073.71	718390.76	-1.56	50.05	
Area A	CPT-R10	11/29/2006	633890.09	718605.51	-1.065	50.20	

Notes:
[1] Northing and easting coordinates in New Jersey State Plane NAD83 (feet
[2] Elevation in North American Vertical Datum (NAVD) 1988 (feet)
All depth measurement in feet below sediment surface.

Table 2-2
OU2 TarGOST™ Confirmatory Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	Sample Date	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	PAH Fingerprint
SD-A-10	12/5/2006	633840.37	718615.31	SD-A-10-29-30	29 - 30		X	X	X	X	
SD-A-11	12/1/2006	633793.53	718525.77	SD-A-11-17.5-18.5	17.5 - 18.5		X	X	X		X
SD-A-14	12/4/2006	633676.91	718266.28	SD-A-14-36.5-37.5	36.5 - 37.5		X	X	X		
SD-A-14	12/4/2006	633686.89	718270.28	SD-A-14-57-58	57 - 58		X	X	X		X
SD-A-16	12/4/2006	633549.78	718046.83	SD-A-16-7.0-8.0	7 - 8	X	X	X	X		
SD-A-16	12/4/2006	633549.78	718046.83	DUP-120406-SD	7 - 8		X	X	X		
SD-A-20	12/4/2006	633703.16	718123.49	SD-A-20-44-45	44 - 45		X	X	X		X
SD-A-22	12/1/2006	633800.56	718280.11	SD-A-22-50-51	50 - 51		X	X	X		
SD-A-23	12/1/2006	633850.51	718376.01	SD-A-23-23.25-23.75	23.25 - 23.75		X	X	X		
SD-A-24	12/1/2006	633898.93	718468.18	SD-A-24-23.5-24.5	23.5 - 24.5		X	X	X		
SD-A-24	12/5/2006	633901.37	718466.29	SD-A-24-32.5-33.5	32.5 - 33.5	X	X	X	X	X	
SD-A-27	12/5/2006	634018.47	718717.63	SD-A-27-33-34	33 - 34		X	X	X	X	
SD-A-44	12/5/2006	634095.99	718363.84	SD-A-44-18-19	18 - 19		X	X	X	X	
SD-R-1	12/5/2006	634030.49	718088.85	SD-R-1-42.5-43.5	42.5 - 43.5		X	X	X	X	X
SD-R-10	12/5/2006	633889.57	718605.67	SD-R-10-36-37	36 - 37		X	X	X	X	

Notes:
[1] Northing and easting coordinates in New Jersey State Plane NAD83 (feet)
[2] Feet below sediment surface
VOC - volatile organic compounds
SVOC - semivolatile organic compounds
PCB - polychlorinated biphenyls
Metals include arsenic, chromium, lead, copper, nickel, silver, and zinc

Table 2-3
Surface Sediment Sample Summary
Quanta Resouces Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Z (Elevation)[2] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[3]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Comments
SD-A-01	633387.56	717971.92	-0.469	SD-A-01-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-02	633466.79	718094.13	-0.3	SD-A-02-0-0.5	10/30/2006	0-0.5'	X	X	X	X						
SD-A-03	633548.22	718208.49	-0.418	SD-A-03-0-0.5	10/30/2006	0-0.5'	X	X	X	X			X			
SD-A-04	633590.39	718315.15	0	SD-A-04-0-0.5	10/25/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-05	--	--	--	--	--	--										No access to sample area due to dilapidated pier structures in vicinity of sample location.
SD-A-06	633653.5	718478.22	-0.247	SD-A-06-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X			X	
SD-A-07	633690.05	718575.54	-0.08	SD-A-07-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X		X	
SD-A-08	633746.71	718663.15	-0.063	SD-A-08-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-09	633886.07	718703.48	-0.148	SD-A-09-0-0.5	10/23/2006	0-0.5'	X	X	X	X		X				
SD-A-10	633841.57	718618.07	-1.028	SD-A-10-0-0.5	10/23/2006	0-0.5'	X	X	X	X		X	X			
SD-A-11	633794.46	718521.86	-1.135	SD-A-11-0-0.5	10/23/2006	0-0.5'	X	X	X	X		X				
SD-A-12	633748	718430.44	-1.211	SD-A-12-0-0.5	12/6/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-13	633706.98	718337.16	-0.312	SD-A-13-0-0.5	10/23/2006	0-0.5'	X	X	X	X		X				
SD-A-14	633677.2	718258.41	-0.631	SD-A-14-0-0.5	10/23/2006	0-0.5'	X	X	X	X		X	X			
SD-A-15	633608.72	718162.68	-1.102	SD-A-15-0-0.5	10/30/2006	0-0.5'	X	X	X	X						
SD-A-16	633548.52	718050.44	-1.482	SD-A-16-0-0.5	10/30/2006	0-0.5'	X	X	X	X			X		X	
SD-A-17	633484.97	717926.49	-1.878	SD-A-17-0-0.5	12/6/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-18	633573.12	717878.39	-2.138	DUP-103006-SD	10/30/2006	0-0.5'	X	X	X	X			X			
SD-A-18	633573.12	717878.39	-2.138	SD-A-18-0-0.5	10/30/2006	0-0.5'	X	X	X	X			X			
SD-A-19	633643.11	718000.21	-1.736	SD-A-19-0-0.5	10/30/2006	0-0.5'	X	X	X	X						
SD-A-20	633707.64	718125.73	-0.878	SD-A-20-0-0.5	10/30/2006	0-0.5'	X	X	X	X			X			
SD-A-21	633779.31	718214.21	-0.894	SD-A-21-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-22	633800.49	718285.9	-1.778	SD-A-22-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-23	633855.43	718382.13	-1.584	SD-A-23-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X			X	
SD-A-24	633897.31	718469.01	-1.538	SD-A-24-0-0.5	11/14/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-25	633944.42	718561.05	-1.46	SD-A-25-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X			X	
SD-A-26	633985.61	718654.88	-0.807	SD-A-26-0-0.5	12/7/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-27	634052.99	718715.43	0	SD-A-27-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-28	634131.58	718687.56	-0.06	SD-A-28-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-29	634090.27	718605.85	-1.924	SD-A-29-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-30	634042.29	718511.93	-1.791	SD-A-30-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-31	633999.66	718420.1	-1.951	SD-A-31-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				

Table 2-3
Surface Sediment Sample Summary
Quanta Resouces Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Z (Elevation)[2] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[3]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Comments
SD-A-32	633945.41	718322.86	-2.018	SD-A-32-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-33	633904.6	718237.05	-1.881	DUP-102406-SD	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-33	633904.6	718237.05	-1.881	SD-A-33-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-34	633868.16	718170.87	-1.387	SD-A-34-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-35	633803.84	718083.13	-0.883	SD-A-35-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-36	633730.15	717955.51	-2.024	SD-A-36-0-0.5	12/6/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-37	633671.83	717831.79	-2.385	SD-A-37-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-38	633828.11	717752.13	-2.681	SD-A-38-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-39	633887.06	717884.58	-2.505	SD-A-39-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-40	633949.14	718011.71	-0.819	SD-A-40-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X	X			
SD-A-41	633965.54	718104.78	-0.608	SD-A-41-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-42	634006.27	718185.08	-2.428	SD-A-42-0-0.5	12/6/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-43	634048.23	718275.89	-2.067	DUP-102306-SD	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-43	634048.23	718275.89	-2.067	SD-A-43-0-0.5	10/23/2006	0-0.5'	X	X	X	X	X	X				
SD-A-44	634097.9	718363.01	-2.184	SD-A-44-0-0.5	11/13/2006	0-0.5'	X	X	X	X	X	X	X	X	X	
SD-A-45	634140.59	718453.71	-1.906	SD-A-45-0-0.5	10/24/2006	0-0.5'	X	X	X	X	X	X				
SD-A-46	634183.97	718549	-1.938	SD-A-46-0-0.5	12/7/2006	0-0.5'	X	X	X	X	X	X	X	X		
SD-A-47	634226.92	718618.71	-0.261	SD-A-47-0-0.5	10/25/2006	0-0.5'	X	X	X	X	X	X				
SD-B-01	633943.7	717695	-3.485	SD-B-01-0-0.5	10/23/2006	0-0.5'		X	X	X	X	X				
SD-B-02	634027.75	717846.16	-3.109	SD-B-02-0-0.5	10/23/2006	0-0.5'		X	X	X	X	X	X			
SD-B-03	634096.9	717979.43	-3.053	SD-B-03-0-0.5	11/14/2006	0-0.5'		X	X	X	X	X	X	X		
SD-B-04	634169.96	718119.28	-2.823	SD-B-04-0-0.5	10/23/2006	0-0.5'		X	X	X	X	X	X			
SD-B-05	634234.21	718257.56	-3.016	SD-B-05-0-0.5	10/23/2006	0-0.5'		X	X	X	X	X				
SD-B-06	634299.95	718390.92	-2.363	SD-B-06-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X	X			
SD-B-07	634377.56	718531.03	-0.636	SD-B-07-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X				
SD-B-08	634439.94	718666.71	-2.241	SD-B-08-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X	X			
SD-B-09	634506.65	718802.15	-1.817	SD-B-09-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X				
SD-B-10	634566.45	718927.56	-0.862	SD-B-10-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X	X			
SD-B-11	634704.76	718859.02	-0.886	SD-B-11-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X				
SD-B-12	634640.16	718727.14	-2.296	SD-B-12-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X	X			
SD-B-13	634571.36	718573.96	-2.395	DUP-120706-SD2	12/7/2006	0-0.5'	X	X	X	X	X	X			X	
SD-B-13	634571.36	718573.96	-2.395	SD-B-13-0-0.5	12/7/2006	0-0.5'	X	X	X	X	X	X	X	X	X	
SD-B-14	634507.17	718458.93	-1.479	SD-B-14-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X	X			

Table 2-3
Surface Sediment Sample Summary
Quanta Resouces Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Z (Elevation)[2] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[3]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Comments
SD-B-15	634438.75	718317.2	-3.203	SD-B-15-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X				
SD-B-16	634371.39	718179.53	-3.743	SD-B-16-0-0.5	11/13/2006	0-0.5'		X	X	X	X	X	X	X	X	
SD-B-17	634299.07	718043.86	-4.205	SD-B-17-0-0.5	10/23/2006	0-0.5'		X	X	X	X	X				
SD-B-18	634222.99	717908.79	-4.893	SD-B-18-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X	X			
SD-B-19	634160.91	717773.63	-8.63	SD-B-19-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X			X	
SD-B-20	634092.31	717623.94	-12.64	SD-B-20-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X	X			
SD-B-21	634225.27	717552.65	-24.375	SD-B-21-0-0.5	11/14/2006	0-0.5'		X	X	X	X	X	X	X		
SD-B-22	634299.36	717697.72	-23.298	SD-B-22-0-0.5	10/24/2006	0-0.5'		X	X	X	X	X	X			
SD-B-23	634373.99	717838.25	-21.719	SD-B-23-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X				
SD-B-24	634440.25	717971.27	-20.753	SD-B-24-0-0.5	11/14/2006	0-0.5'		X	X	X	X	X	X	X		
SD-B-25	634514.18	718112.94	-18.366	--	--	--										No recovery after several attempts with Ponar dredge. Located on a sloped area.
SD-B-26	634576.72	718246.96	-14.329	--	--	--										No recovery after several attempts with Ponar dredge. Located on a sloped area.
SD-B-27	634646.54	718379.44	-8.414	SD-B-27-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X				
SD-B-28	634712.26	718520.93	-7.26	SD-B-28-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X	X			
SD-B-29	634782.64	718656.86	-3.218	SD-B-29-0-0.5	10/25/2006	0-0.5'		X	X	X	X	X				
SD-DS-01	633082.9	717500.94	0	SD-DS-1-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-DS-02	633172.54	716992.94	0	SD-DS-2-0-0.5	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-DS-02	633172.54	716992.94	0	DUP-103106-SD	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-DS-03	632804	716225.96	0	SD-DS-3-0-0.5	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-DS-04	632221.35	714395.19	0	SD-DS-4-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-DS-05	631139.45	712595.65	0	SD-DS-5-0-0.5	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-DS-06	630213.17	710849.32	0	SD-DS-6-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-DS-07	629182.24	709513.06	0	SD-DS-7-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-DS-08	628056.85	708126.7	0	SD-DS-8-0-0.5	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-DS-09	627861.84	706773.66	0	SD-DS-9-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-DS-10	626969.52	705125.66	0	SD-DS-10-0-0.5	10/31/2006	0-0.5'		X	X	X	X	X	X		X	
SD-NA-01	634335.73	719274.05	0	SD-NA-1-0-0.5	10/31/2006	0-0.5'		X	X	X			X			
SD-NA-02	634465.4	719202.39	0	SD-NA-2-0-0.5	10/31/2006	0-0.5'		X	X	X						
SD-NA-03	634551.48	719335.59	0	SD-NA-3-0-0.5	12/7/2006	0-0.5'	X	X	X	X	X	X	X		X	
SD-NA-04	634436.4	719412.25	0	SD-NA-4-0-0.5	10/31/2006	0-0.5'		X	X	X						
SD-NA-05	634508.77	719546.54	0	SD-NA-5-0-0.5	10/30/2006	0-0.5'		X	X	X			X			
SD-PAH-01	641624.78	724805.09	0	SD-PAH-1-0-0.5	10/31/2006	0-0.5'									X	

Table 2-3
Surface Sediment Sample Summary
Quanta Resouces Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Z (Elevation)[2] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[3]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Comments
SD-PAH-02	636726.16	722902.45	0	SD-PAH-2-0-0.5	10/30/2006	0-0.5'									X	
SD-PAH-03	642197.91	737506.94	0	SD-PAH-3-0-0.5	10/30/2006	0-0.5'									X	
SD-PAH-04	642343.75	737495.57	0	SD-PAH-4-0-0.5	10/30/2006	0-0.5'									X	
SD-US-01	635523.74	720168.22	0	SD-US-1-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-02	636187.69	722254.3	0	SD-US-2-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-03	635989.83	721183.37	0	SD-US-3-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-04	637560.29	724302.41	0	SD-US-4-0-0.5	10/30/2006	0-0.5'		X	X	X			X			
SD-US-05	638198.52	725723.42	0	SD-US-5-0-0.5	10/30/2006	0-0.5'		X	X	X			X			
SD-US-06	639238.78	728024.48	0	SD-US-6-0-0.5	10/30/2006	0-0.5'		X	X	X			X			
SD-US-07	639429.09	729696.57	0	SD-US-7-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-08	640097.89	732436.82	0	SD-US-8-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-09	641149.13	734528.33	0	SD-US-9-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	
SD-US-10	642276.61	737608.7	0	SD-US-10-0-0.5	10/30/2006	0-0.5'		X	X	X	X	X	X		X	

Notes:
[1] Northing an easting coordinates in New Jersey State Plane NAD83 (feet
[2] Elevation in North American Vertical Datum (NAVD) 1988 (feet)
[3] Feet below sediment surface
VOC - volatile organic compounds
SVOC - semivolatile organic compounds
PCB - polychlorinated biphenyls
Metals include arsenic, chromium, lead, copper, nickel, silver, and zinc
TOC - total organic content
PAH - polycyclic aromatic hydrocarbons

Table 2-4
Subsurface Sediment Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Archived
SD-A-12	633748	718430.44	SD-A-12-0.5-1.0	12/6/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-12-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-12-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-12-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-12-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-12-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-12-10-12		10-12'										X
			SD-A-12-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-12-14-16		14-16'										X
			SD-A-12-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-12-18-20		18-20'										X
			SD-A-12-20-22		20-22'										X
			SD-A-12-22-24		22-24'	X	X	X	X	X	X	X			
			SD-A-12-24-26		24-26'										X
SD-A-17	633484.97	717926.49	SD-A-17-0.5-1.0	12/6/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-17-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-17-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			DUP-120606-SD		2-4'	X	X	X	X	X	X				
			SD-A-17-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-17-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-17-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-17-10-12		10-12'										X
			SD-A-17-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-17-14-16		14-16'										X
			SD-A-17-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-17-18-20		18-20'										X
			SD-A-17-20-22		20-22'										X
			SD-A-17-22-24		22-24'	X	X	X	X	X	X	X			

Table 2-4
Subsurface Sediment Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Archived
SD-A-24	633897.31	718469.01	SD-A-24-0.5-1	11/14/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-24-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-24-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-24-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-24-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-24-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-24-10-12		10-12'										X
			SD-A-24-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-24-14-16		14-16'										X
			SD-A-24-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-24-18-20		18-20'										X
			SD-A-24-20-22		20-22'										X
SD-A-26	633985.61	718654.88	SD-A-26-0.5-1	12/7/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-26-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-26-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-26-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-26-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-26-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-26-10-12		10-12'										X
			SD-A-26-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-26-14-16		14-16'										X
			SD-A-26-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-26-18-20		18-20'										X
SD-A-36	633730.15	717955.51	SD-A-36-0.5-1	12/6/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-36-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-36-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-36-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-36-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-36-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-36-10-12		10-12'										X
			SD-A-36-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-36-14-16		14-16'										X
			SD-A-36-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-36-18-20		18-20'										X
			SD-A-36-20-22		20-22'										X
			SD-A-36-22-24		22-24'	X	X	X	X	X	X	X			

Table 2-4
Subsurface Sediment Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Archived
SD-A-42	634006.27	718185.08	SD-A-42-0.5-1.0	12/6/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-42-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-42-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-42-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			DUP-120606-SD2		4-6'	X	X	X	X	X	X				
			SD-A-42-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-42-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-42-10-12		10-12'										X
			SD-A-42-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-42-14-16		14-16'										X
			SD-A-42-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-42-18-20		18-20'										X
			SD-A-42-20-22		20-22'										X
			SD-A-42-22-24		22-24'	X	X	X	X	X	X	X			
SD-A-44	634097.9	718363.01	SD-A-44-0.5-1.0	11/13/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-44-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-44-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-44-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-44-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			DUP-111306-SD		6-8'	X	X	X	X	X	X	X			
			SD-A-44-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-A-44-10-12		10-12'										X
			SD-A-44-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-44-14-16		14-16'										X
			SD-A-44-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-44-18-20		18-20'										X
			SD-A-44-20-22		20-22'										X
			SD-A-44-22-22.5		22-22.5'	X	X	X	X	X	X	X			
SD-A-46	634183.97	718549	SD-A-46-0.5-1.0	12/7/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-A-46-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-A-46-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-A-46-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-A-46-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-A-46-8.0-10		8-10'	X	X	X	X	X	X	X			
			DUP-120706-SD		8-10'	X	X	X	X	X	X	X			
			SD-A-46-10-12		10-12'										X
			SD-A-46-12-14		12-14'	X	X	X	X	X	X	X			
			SD-A-46-14-16		14-16'										X
			SD-A-46-16-18		16-18'	X	X	X	X	X	X	X			
			SD-A-46-18-20		18-20'										X

Table 2-4
Subsurface Sediment Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Archived
SD-B-3	634096.9	717979.43	SD-B-3-0.5-1.0	11/14/2006	0.5-1'		X	X	X	X	X	X	X		
			SD-B-3-1.0-2.0		1-2'		X	X	X	X	X	X			
			SD-B-3-2.0-4.0		2-4'		X	X	X	X	X	X			
			SD-B-3-4.0-6.0		4-6'		X	X	X	X	X	X			
			SD-B-3-6.0-8.0		6-8'		X	X	X	X	X	X			
			SD-B-3-8.0-10		8-10'		X	X	X	X	X	X			
			SD-B-3-10-12		10-12'										X
			SD-B-3-12-14		12-14'		X	X	X	X	X	X			
			SD-B-3-14-16		14-16'										X
			SD-B-3-16-18		16-18'		X	X	X	X	X	X			
			SD-B-3-18-20		18-20'										X
			SD-B-3-20-22		20-22'										X
			SD-B-3-22-24		22-24'		X	X	X	X	X	X			
			SD-B-3-24-26		24-26'										X
SD-B-13	634571.36	718573.96	SD-B-13-0.5-1.0	12/7/2006	0.5-1'	X	X	X	X	X	X	X	X		
			SD-B-13-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-B-13-2.0-4.0		2-4'	X	X	X	X	X	X	X			
			SD-B-13-4.0-6.0		4-6'	X	X	X	X	X	X	X			
			SD-B-13-6.0-8.0		6-8'	X	X	X	X	X	X	X			
			SD-B-13-8.0-10		8-10'	X	X	X	X	X	X	X			
			SD-B-13-10-12		10-12'										X
			SD-B-13-12-14		12-14'	X	X	X	X	X	X	X			
			DUP-120706-SD3		12-14'	X	X	X	X	X	X				
			SD-B-13-14-16		14-16'										X
			SD-B-13-16-18		16-18'	X	X	X	X	X	X	X			
			SD-B-13-18-20		18-20'										X
SD-B-16	634371.39	718179.53	SD-B-16-0.5-1.0	11/13/2006	0.5-1'		X	X	X	X	X	X	X		
			SD-B-16-1.0-2.0		1-2'		X	X	X	X	X	X			
			SD-B-16-2.0-4.0		2-4'		X	X	X	X	X	X			
			SD-B-16-4.0-6.0		4-6'		X	X	X	X	X	X			
			SD-B-16-6.0-8.0		6-8'		X	X	X	X	X	X			
			SD-B-16-8.0-10		8-10'		X	X	X	X	X	X			
			SD-B-16-10-12		10-12'										X
			SD-B-16-12-14		12-14'		X	X	X	X	X	X			
			SD-B-16-14-16		14-16'										X
			SD-B-16-16-18		16-18'		X	X	X	X	X	X			
			SD-B-16-18-20		18-20'										X
			SD-B-16-20-22		20-22'										X
			SD-B-16-22-24		22-24'		X	X	X	X	X	X			

Table 2-4
Subsurface Sediment Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample ID	Sample Date	Sample Depth (feet bss)[2]	VOC	SVOC	PCB Aroclors	Metals	Mercury	TOC	Grain Size	PCB Congeners	PAH Fingerprint	Archived
SD-B-21	634225.27	717552.65	SD-B-21-0.5-1.0	11/14/2006	0.5-1'		X	X	X	X	X	X	X		
			SD-B-21-1.0-2.0		1-2'		X	X	X	X	X	X			
			SD-B-21-2.0-4.0		2-4'		X	X	X	X	X	X			
			DUP-111406-SD		2-4'		X	X	X	X	X	X			
			SD-B-21-4.0-6.0		4-6'		X	X	X	X	X	X			
			SD-B-21-6.0-8.0		6-8'		X	X	X	X	X	X			
			SD-B-21-8.0-10		8-10'		X	X	X	X	X	X			
			SD-B-21-10-12		10-12'										X
			SD-B-21-12-14		12-14'		X	X	X	X	X	X			
			SD-B-21-14-16		14-16'										X
			SD-B-21-16-18		16-18'		X	X	X	X	X	X			
			SD-B-21-18-20		18-20'										X
			SD-B-21-20-22		20-22'										X
SD-B-24	634440.25	717971.27	SD-B-24-0.5-1.0	11/14/2006	0.5-1'		X	X	X	X	X	X	X		
			SD-B-24-1.0-2.0		1-2'		X	X	X	X	X	X			
			SD-B-24-2.0-4.0		2-4'		X	X	X	X	X	X			
			SD-B-24-4.0-6.0		4-6'		X	X	X	X	X	X			
			SD-B-24-6.0-8.0		6-8'		X	X	X	X	X	X			
			SD-B-24-8.0-10		8-10'		X	X	X	X	X	X			
			SD-B-24-10-12		10-12'										X
			SD-B-24-12-14		12-14'		X	X	X	X	X	X			
			SD-B-24-14-16		14-16'										X
			SD-B-24-16-18		16-18'		X	X	X	X	X	X			
			SD-B-24-18-20		18-20'										X
			SD-B-24-20-22		20-22'										X
			SD-B-24-22-24		22-24'		X	X	X	X	X	X			
SD-NA-3	634551.48	719335.59	SD-NA-3-0.5-1.0	12/7/2006	0.5-1'	X	X	X	X	X	X	X			
			SD-NA-3-1.0-2.0		1-2'	X	X	X	X	X	X	X			
			SD-NA-3-2.0-4.0		2-4'	X	X	X	X	X	X	X			

Notes:
[1] Northing an easting coordinates in New Jersey State Plane NAD83 (feet)
[2] Feet below sediment surface
VOC - volatile organic compounds
SVOC - semivolatile organic compounds
PCB - polychlorinated biphenyls
Metals include arsenic, chromium, lead, copper, nickel, silver, and zinc
TOC - total organic content
PAH - polycyclic aromatic hydrocarbons

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-A-24	633897.31	718469.01	11/14/2006	SD-A-24-0-2	0 - 2"	X	
				SD-A-24-2-4	2 - 4"		X
				SD-A-24-4-6	4 - 6"		X
				SD-A-24-6-8	6 - 8"		X
				SD-A-24-8-10	8 - 10"		X
				SD-A-24-10-12	10 - 12"		X
				SD-A-24-12-14	12 - 14"	X	
				SD-A-24-14-16	14 - 16"		X
				SD-A-24-16-18	16 - 18"		X
				SD-A-24-18-20	18 - 20"		X
				SD-A-24-20-22	20 - 22"		X
				SD-A-24-22-24	22 - 24"		X
				SD-A-24-24-26	24 - 26"	X	
				SD-A-24-26-28	26 - 28"		X
				SD-A-24-28-30	28 - 30"		X
				SD-A-24-30-32	30 - 32"	X	
				SD-A-24-32-34	32 - 34"		X
				SD-A-24-34-36	34 - 36"		X
				SD-A-24-36-38	36 - 38"	X	
				SD-A-24-38-40	38 - 40"		X
				SD-A-24-40-42	40 - 42"		X
				SD-A-24-42-44	42 - 44"	X	
				SD-A-24-44-46	44 - 46"		X
				SD-A-24-46-48	46 - 48"		X
				SD-A-24-48-50	48 - 50"	X	
				SD-A-24-50-52	50 - 52"		X
				SD-A-24-52-54	52 - 54"		X
				SD-A-24-54-56	54 - 56"	X	
				SD-A-24-56-58	56 - 58"		X
				SD-A-24-58-60	58 - 60"		X
				SD-A-24-60-62	60 - 62"	X	
				SD-A-24-62-64	62 - 64"		X
				SD-A-24-64-66	64 - 66"		X
				SD-A-24-66-68	66 - 68"	X	
				SD-A-24-68-70	68 - 70"		X
				SD-A-24-70-72	70 - 72"		X
				SD-A-24-72-74	72 - 74"	X	
				SD-A-24-74-76	74 - 76"		X
				SD-A-24-76-78	76 - 78"		X
				SD-A-24-78-80	78 - 80"	X	
				SD-A-24-80-82	80 - 82"		X
				SD-A-24-82-84	82 - 84"		X
				SD-A-24-84-86	84 - 86"	X	
				SD-A-24-86-88	86 - 88"		X
				SD-A-24-88-90	88 - 90"		X
				SD-A-24-90-92	90 - 92"		X
				SD-A-24-92-94	92 - 94"		X
				SD-A-24-94-96	94 - 96"		X
				SD-A-24-96-98	96 - 98"	X	
				SD-A-24-98-100	98 - 100"		X
				SD-A-24-100-102	100 - 102"		X
				SD-A-24-102-104	102 - 104"		X
				SD-A-24-104-106	104 - 106"		X
				SD-A-24-106-108	106 - 108"		X

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-A-24	633897.31	718469.01	11/14/2006	SD-A-24-108-110	108 - 110"	X	
				SD-A-24-110-112	110 - 112"		X
				SD-A-24-112-114	112 - 114"		X
				SD-A-24-114-116	114 - 116"	X	
				SD-A-24-116-118	116 - 118"		X
				SD-A-24-118-120	118 - 120"		X
				SD-A-24-120-122	120 - 122"	X	
				SD-A-24-122-124	122 - 124"		X
				SD-A-24-124-126	124 - 126"		X
				SD-A-24-126-128	126 - 128"	X	
				SD-A-24-128-130	128 - 130"		X
				SD-A-24-130-132	130 - 132"		X
				SD-A-24-132-134	132 - 134"	X	
				SD-A-24-134-136	134 - 136"		X
				SD-A-24-136-138	136 - 138"		X
				SD-A-24-138-140	138 - 140"		X
				SD-A-24-140-142	140 - 142"		X
				SD-A-24-142-144	142 - 144"		X
				SD-A-24-144-146	144 - 146"	X	
				SD-A-24-146-148	146 - 148"		X
				SD-A-24-148-150	148 - 150"		X
				SD-A-24-150-152	150 - 152"		X
				SD-A-24-152-154	152 - 154"		X
				SD-A-24-154-156	154 - 156"		X
				SD-A-24-156-158	156 - 158"	X	
				SD-A-24-158-160	158 - 160"		X
				SD-A-24-160-162	160 - 162"		X
				SD-A-24-162-164	162 - 164"		X
				SD-A-24-164-166	164 - 166"		X
				SD-A-24-166-168	166 - 168"		X
				SD-A-24-168-170	168 - 170"	X	
				SD-A-24-170-172	170 - 172"	X	
				SD-A-24-172-174	172 - 174"	X	

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-A-44	634097.9	718363.01	11/13/2006	SD-A-44-0-2	0 - 2"	X	
				SD-A-44-2-4	2 - 4"		X
				SD-A-44-4-6	4 - 6"		X
				SD-A-44-6-8	6 - 8"		X
				SD-A-44-8-10	8 - 10"		X
				SD-A-44-10-12	10 - 12"		X
				SD-A-44-12-14	12 - 14"	X	
				SD-A-44-14-16	14 - 16"		X
				SD-A-44-16-18	16 - 18"		X
				SD-A-44-18-20	18 - 20"	X	
				SD-A-44-20-22	20 - 22"		X
				SD-A-44-22-24	22 - 24"		X
				SD-A-44-24-26	24 - 26"	X	
				SD-A-44-26-28	26 - 28"		X
				SD-A-44-28-30	28 - 30"		X
				SD-A-44-30-32	30 - 32"	X	
				SD-A-44-32-34	32 - 34"		X
				SD-A-44-34-36	34 - 36"		X
				SD-A-44-36-38	36 - 38"	X	
				SD-A-44-38-40	38 - 40"		X
				SD-A-44-40-42	40 - 42"		X
				SD-A-44-42-44	42 - 44"	X	
				SD-A-44-44-46	44 - 46"		X
				SD-A-44-46-48	46 - 48"		X
				SD-A-44-48-50	48 - 50"	X	
				SD-A-44-50-52	50 - 52"		X
				SD-A-44-52-54	52 - 54"		X
				SD-A-44-54-56	54 - 56"	X	
				SD-A-44-56-58	56 - 58"		X
				SD-A-44-58-60	58 - 60"		X
				SD-A-44-60-62	60 - 62"	X	
				SD-A-44-62-64	62 - 64"		X
				SD-A-44-64-66	64 - 66"		X
				SD-A-44-66-68	66 - 68"	X	
				SD-A-44-68-70	68 - 70"		X
				SD-A-44-70-72	70 - 72"		X
				SD-A-44-72-74	72 - 74"	X	
				SD-A-44-74-76	74 - 76"		X
				SD-A-44-76-78	76 - 78"		X
				SD-A-44-78-80	78 - 80"	X	
				SD-A-44-80-82	80 - 82"		X
				SD-A-44-82-86	82 - 84"		X
				SD-A-44-84-86	84 - 86"	X	
				SD-A-44-86-88	86 - 88"		X
				SD-A-44-88-90	88 - 90"		X
				SD-A-44-90-92	90 - 92"		X
				SD-A-44-92-94	92 - 94"		X
				SD-A-44-94-96	94 - 96"		X
				SD-A-44-96-98	96 - 98"	X	
				SD-A-44-98-100	98 - 100"		X
				SD-A-44-100-102	100 - 102"		X
				SD-A-44-102-104	102 - 104"		X
				SD-A-44-104-106	104 - 106"		X
				SD-A-44-106-108	106 - 108"		X

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-A-44	634097.9	718363.01	11/13/2006	SD-A-44-108-110	108 - 110"	X	
				SD-A-44-110-112	110 - 112"		X
				SD-A-44-112-114	112 - 114"		X
				SD-A-44-114-116	114 - 116"		X
				SD-A-44-116-118	116 - 118"		X
				SD-A-44-118-120	118 - 120"		X
				SD-A-44-120-122	120 - 122"	X	
				SD-A-44-122-124	122 - 124"		X
				SD-A-44-124-126	124 - 126"		X
				SD-A-44-126-128	126 - 128"	X	
				SD-A-44-128-130	128 - 130"		X
				SD-A-44-130-132	130 - 132"		X
				SD-A-44-132-134	132 - 134"	X	
				SD-A-44-134-136	134 - 136"		X
				SD-A-44-136-138	136 - 138"		X
				SD-A-44-138-140	138 - 140"	X	
				SD-A-44-140-142	140 - 142"		X
				SD-A-44-142-144	142 - 144"		X
				SD-A-44-144-146	144 - 146"	X	
				SD-A-44-146-148	146 - 148"		X
				SD-A-44-148-150	148 - 150"		X
				SD-A-44-150-152	150 - 152"	X	
				SD-A-44-152-154	152 - 154"		X
				SD-A-44-154-156	154 - 156"		X
				SD-A-44-156-158	156 - 158"	X	
				SD-A-44-158-160	158 - 160"	X	
				SD-A-44-160-162	160 - 162"	X	
				SD-A-44-162-164	162 - 164"	X	
				SD-A-44-164-166	164 - 166"	X	
				SD-A-44-166-168	166 - 168"	X	

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-B-16	634371.39	718179.53	11/13/2006	SD-B-16-0-2	0 - 2"	X	
				SD-B-16-2-4	2 - 4"		X
				SD-B-16-4-6	4 - 6"		X
				SD-B-16-6-8	6 - 8"		X
				SD-B-16-8-10	8 - 10"		X
				SD-B-16-10-12	10 - 12"		X
				SD-B-16-12-14	12 - 14"	X	
				SD-B-16-14-16	14 - 16"		X
				SD-B-16-16-18	16 - 18"		X
				SD-B-16-18-20	18 - 20"		X
				SD-B-16-20-22	20 - 22"		X
				SD-B-16-22-24	22 - 24"		X
				SD-B-16-24-26	24 - 26"	X	
				SD-B-16-26-28	26 - 28"		X
				SD-B-16-28-30	28 - 30"		X
				SD-B-16-30-32	30 - 32"	X	
				SD-B-16-32-34	32 - 34"		X
				SD-B-16-34-36	34 - 36"		X
				SD-B-16-36-38	36 - 38"	X	
				SD-B-16-38-40	38 - 40"		X
				SD-B-16-40-42	40 - 42"		X
				SD-B-16-42-44	42 - 44"	X	
				SD-B-16-44-46	44 - 46"		X
				SD-B-16-46-48	46 - 48"		X
				SD-B-16-48-50	48 - 50"	X	
				SD-B-16-50-52	50 - 52"		X
				SD-B-16-52-54	52 - 54"		X
				SD-B-16-54-56	54 - 56"	X	
				SD-B-16-56-58	56 - 58"		X
				SD-B-16-58-60	58 - 60"		X
				SD-B-16-60-62	60 - 62"	X	
				SD-B-16-62-64	62 - 64"		X
				SD-B-16-64-66	64 - 66"		X
				SD-B-16-66-68	66 - 68"	X	
				SD-B-16-68-70	68 - 70"		X
				SD-B-16-70-72	70 - 72"		X
				SD-B-16-72-74	72 - 74"	X	
				SD-B-16-74-76	74 - 76"		X
				SD-B-16-76-78	76 - 78"		X
				SD-B-16-78-80	78 - 80"	X	
				SD-B-16-80-82	80 - 82"		X
				SD-B-16-82-84	82 - 84"		X
				SD-B-16-84-86	84 - 86"	X	
				SD-B-16-86-88	86 - 88"		X
				SD-B-16-88-90	88 - 90"		X
				SD-B-16-90-92	90 - 92"	X	
				SD-B-16-92-94	92 - 94"		X
				SD-B-16-94-96	94 - 96"		X
				SD-B-16-96-98	96 - 98"	X	
				SD-B-16-98-100	98 - 100"		X
				SD-B-16-100-102	100 - 102"		X
				SD-B-16-102-104	102 - 104"		X
				SD-B-16-104-106	104 - 106"		X
				SD-B-16-106-108	106 - 108"		X

Table 2-5
Sediment Geochronology Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (inches bss)[2]	Cesium-137	Archive: Cesium-137
SD-B-16	634371.39	718179.53	11/13/2006	SD-B-16-108-110	108 - 110"	X	
				SD-B-16-110-112	110 - 112"		X
				SD-B-16-112-114	112 - 114"		X
				SD-B-16-114-116	114 - 116"		X
				SD-B-16-116-118	116 - 118"		X
				SD-B-16-118-120	118 - 120"		X
				SD-B-16-120-122	120 - 122"	X	
				SD-B-16-122-124	122 - 124"		X
				SD-B-16-124-126	124 - 126"		X
				SD-B-16-126-128	126 - 128"		X
				SD-B-16-128-130	128 - 130"		X
				SD-B-16-130-132	130 - 132"		X
				SD-B-16-132-134	132 - 134"	X	
				SD-B-16-134-136	134 - 136"		X
				SD-B-16-136-138	136 - 138"		X
				SD-B-16-138-140	138 - 140"		X
				SD-B-16-140-142	140 - 142"		X
				SD-B-16-142-144	142 - 144"		X
				SD-B-16-144-146	144 - 146"	X	
				SD-B-16-146-148	146 - 148"		X
				SD-B-16-148-150	148 - 150"		X
				SD-B-16-150-152	150 - 152"		X
				SD-B-16-152-154	152 - 154"		X
				SD-B-16-154-156	154 - 156"	X	
				SD-B-16-156-158	156 - 158"	X	
				SD-B-16-158-160	158 - 160"		X
				SD-B-16-160-162	160 - 162"	X	
				SD-B-16-162-164	162 - 164"		X
				SD-B-16-164-166	164 - 166"	X	
				SD-B-16-166-168	166 - 168"		X
				SD-B-16-168-170	168 - 170"	X	

Notes:
[1] Northing an easting coordinates in New Jersey State Plane NAD83 (feet)
[2] Inches below sediment surface

Table 2-6
Sediment Geotechnical Sample Summary
Quanta Resources Superfund Site, Edgewater, New Jersey

Location ID	X (Easting)[1] (feet)	Y (Northing)[1] (feet)	Sample Date	Sample ID	Sample Depth (feet bss)[2]	Specific Gravity	Organic content	Atterberg Limits	Water Content
SD-A-12	633748	718430.44	12/6/2006	SD-A-12-2-5	2-5'	x	x	x	x
				SD-A-12-5-8	5-8'	x	x	x	x
				SD-A-12-10-13	10-13'	x	x	x	x
SD-A-42	634006.27	718185.08	12/6/2006	SD-A-42-0-5	0-5'	x	x	x	x
				SD-A-42-5-10	5-10'	x	x	x	x
				SD-A-42-10-14	10-14'	x	x	x	x

Notes:
[1] Northing an easting coordinates in New Jersey State Plane NAD83 (feet)
[2] Feet below sediment surface

Table 3-1. Summary of TarGOST™, Confirmatory Sample, and Visual Observation Data Summary

Area	Location ID	TarGOST™ Boring Depth (feet bss)	Maximum Fluorescence (% RE)	Depth of Maximum Fluorescence (feet bss)	Visual Observations Confirmatory Sample	Confirmatory Sample Interval(s) (feet bss)	Coal Tar in Confirmatory Sample Interval?	Total PAHs in Confirmatory Sample (mg/kg)	Maximum Fluoresence in Confirmatory Sample Interval (% RE)	Visual Observations Vibracore[1]	TarGOST™ & Visual Observation Correlation
Area A	A-01	50.08	2.6	10.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-02	50.17	3.76	14.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-06	31.76	13.43	27.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-07 A-07b	18.82	7.77	14.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-08	29.09	11.36	28.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-10	41.64	25.39	34.1	29 to 30' bss: Several cm scale lenses of coal tar with obvious coal tar odor. (viscous, semi-solid)	29-30	Yes	4542	12.79	N/A	FAIR
Area A	A-11	42.62	17.83	17.8	17.5 to 18' bss: Mm to cm scale lenses of coal tar with obvious coal tar odor. (viscous, semi-solid)	17.5-18.0	Yes	6939	17.83	N/A	GOOD
Area A	A-12	46.64	10.43	26.3	N/A	N/A	N/A	N/A	5.46	17 to 25' bss: Some small mm to cm scale lenses of coal tar observed with obvious coal tar odor present. Coal tar estimated at < 5% of recovered material. (viscous, semi-solid)	FAIR
Area A	A-13	50.18	9.12	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-14	62.39	11.82	37.5	36.5 to 37.5'bss: Some cm scale lenses of coal tar with obvious coal tar odor. (viscous, semi-solid)	36.5 - 37.5	Yes	9942	11.82	N/A	POOR
			16.67	57.6	57 to 58' bss: No coal tar observed.	57 - 58	No	199	16.67	N/A	POOR
Area A	A-15	50.1	2.65	20.6	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-16 A-16b A-16c	50.04	19.91	7.1	7 to 8' bss: No coal tar observed, coal tar odor. 9' bss (approx): Some cm scale lenses of coal tar.	7 - 8	No	287	19.91	N/A	POOR
Area A	A-17	50.09	10.06	4.7	N/A	N/A	N/A	N/A	N/A	14 to 21' bss: Coal tar observed in small mm to cm scale lenses with obvious coal tar odor present. Coal tar estimated at <5% of recovered material.	N/A
Area A	A-18 A-18b	50.03	6.11	21.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-19	50.15	5.17	5.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-20	50.25	151.11	45.6	44 to 45' bss: No coal tar observed, no odor, 0.0 PID.	44 - 45	No	61	66.05	N/A	POOR
Area A	A-21	50.11	8.12	37.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-22	53.07	3.67	49.5	50 to 51' bss: No coal tar observed.	50 - 51	NO	370	3.3	N/A	N/A
Area A	A-23	50.11	19.18	23.5	23.25 to 23.75' bss: Mm to cm scale lenses of coal tar with obvious coal tar odor. (viscous, semi-solid)	23.25 - 23.75	Yes	2408	19.18	N/A	GOOD
Area A	A-24	50.17	9.62	24.4	23.5 to 24.5' bss: Trace coal tar observed. PID - 93. (viscous, semi-solid)	23.5 - 24.5	Yes	3986	9.62	8.5 to 21' bss: Coal tar pockets throughout; strong odor.	GOOD
					32.5 to 33.5' bss: No coal tar observed.	32.5 - 33.5	No	0.67	2.46	N/A	GOOD
Area A	A-25	50.16	15.93	26.3	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-26	50.19	5.48	44.0	N/A	N/A	N/A	N/A	N/A	14 to 16' bss: Small mm to cm scale lenses of coal tar with obvious coal tar odor. (viscous, semi-solid) 16 to 18' bss: Coal tar slightly less prevalent.	POOR
Area A	A-27	50.15	6.73	33.6	33 to 34' bss: Several cm scale lenses of coal tar with obvious coal tar odor. PID - 80. (viscous, semi-solid)	33 - 34	Yes	1096	6.73	N/A	GOOD
Area A	A-28	50.14	2.65	43.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-29	50.14	2.03	33.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-30	50.28	3.47	18.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-31	50.16	2.31	13.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-32	50.07	2.02	22.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-33	50.12	2.58	34.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-34	50.16	4.14	34.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 3-1. Summary of TarGOST™, Confirmatory Sample, and Visual Observation Data Summary

Area	Location ID	TarGOST™ Boring Depth (feet bss)	Maximum Fluorescence (% RE)	Depth of Maximum Fluorescence (feet bss)	Visual Observations Confirmatory Sample	Confirmatory Sample Interval(s) (feet bss)	Coal Tar in Confirmatory Sample Interval?	Total PAHs in Confirmatory Sample (mg/kg)	Maximum Fluoresence in Confirmatory Sample Interval (% RE)	Visual Observations Vibracore[1]	TarGOST™ & Visual Observation Correlation
Area A	A-35	50.13	1.42	49.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-36	50.12	14.28	17.3	N/A	N/A	N/A	N/A	14.28	16 to 18' bss: Coal tar observed in small mm to cm scale lenses with obvious coal tar odor present. (viscous, semi-solid)	GOOD
Area A	A-37	50.08	3.41	26.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-38	50.01	9.29	21.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-39	50.12	2.78	25.8	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-40	50.09	1.57	49.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-41	50.03	9.93	43.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-42	50.13	3.92	40.9	N/A	N/A	N/A	N/A	N/A	No coal tar/odor observed.	N/A
Area A	A-43	50.08	4.55	18.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-44	50.06	5.54	18.4	18 to 19' bss: No coal tar observed. PID - 8.5.	18 - 19	No	330	N/A	4' bss (approx): Incandescent sheen and odor. 4 to 6' bss: Coal tar, estimated at <10% of recovered material.	UNCLEAR
						22 - 22.5	No	0.27	N/A		UNCLEAR
Area A	A-45	50.19	4.3	14.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	A-46	50.03	2.03	23.6	N/A	N/A	N/A	N/A	N/A	8 to 10 bss: Coal tar observed in small mm to cm scale lenses with obvious coal tar odor present.	N/A
Area A	A-47	50.1	1.38	40.9	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area B	CPT-R01	50.06	3.19	43.3	42.5 to 43.5' bss: Several cm scale lenses of coal tar observed with obvious coal tar odor. PID - 51. (viscous, semi-solid)	42.5 - 43.5	Yes	1167	3.19	N/A	POOR
Area B	CPT-R02	49.76	2.6	26.1	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area B	CPT-R03	50.01	2.5	16.4	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area B	CPT-R04	50.09	3.89	16.0	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R05	50.03	2.18	37.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R06	50.06	2.63	16.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R07	50.11	6.99	27.2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R08	50.09	4.42	18.7	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R09	50.05	4.56	18.5	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Area A	CPT-R10	50.20	15.56	36.3	36 to 37' bss: Several cm scale lenses of coal tar observed with obvious coal tar odor. PID - 88. (viscous, semi-solid)	36 - 37	Yes	4290	15.56	N/A	GOOD

Notes:
All depth measurements in feet below sediment surface (feet bss).
Fluorescence - Non-normalized data from fluorescence channel.
[1] Depth intervals noted are approximate due to core compaction.

Table 3-2a
Statistical Summary of OU2 Surface Sediment (0 to 0.5 feet) Results
Groups A and B
Quanta Resources Superfund Site, Edgewater, New Jersey

Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minmum Concentration Detected (mg/lg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg) [1]	Standard Deviation of Mean (mg/kg)
Inorganics								
Arsenic	-- - --	73 / 73	6.7	92.0	SD-B-10-0-0.5	11	15.3	15.5
Chromium	-- - --	73 / 73	42.8	113	SD-A-02-0-0.5	61.3	62.2	9.51
Copper	-- - --	73 / 73	53.8	105	SD-A-27-0-0.5	78.7	79.5	9.98
Lead	-- - --	73 / 73	55.1	259	SD-A-03-0-0.5	79.3	85.0	25.7
Nickel	-- - --	73 / 73	23.5	136	SD-A-03-0-0.5	31.9	33.8	14.3
Silver	-- - --	73 / 73	1.4	3.60	SD-A-12-0-0.5	2.2	2.30	0.48
Zinc	-- - --	73 / 73	124	301	SD-A-15-0-0.5	177	182	26.1
Mercury	-- - --	61 / 61	0.55	1.30	SD-A-12-0-0.5	0.82	0.83	0.13
Pesticide/Polychlorinated Biphenyls								
Aroclor-1016	0.0028 - 0.0075	0 / 73	--	--	--	0.00365	0.0018	2.74E-04
Aroclor-1221	0.0090 - 0.024	0 / 73	--	--	--	0.0115	0.0058	8.74E-04
Aroclor-1232	0.0080 - 0.022	0 / 73	--	--	--	0.0105	0.0053	8.15E-04
Aroclor-1242	0.0055 - 0.013	65 / 73	0.068	0.47	SD-A-04-0-0.5	0.174	0.17	0.083
Aroclor-1248	0.0050 - 0.014	0 / 73	--	--	--	0.0065	0.0034	5.23E-04
Aroclor-1254	0.0085 - 0.019	49 / 73	0.047	0.53	SD-A-03-0-0.5	0.0561	0.058	0.071
Aroclor-1260	0.0030 - 0.0080	5 / 73	0.069	0.12	SD-A-03-0-0.5	0.00395	0.0080	0.023
Total PCBs (Aroclors)	-- - --	73 / 73	0.048	0.75	SD-A-04-0-0.5	0.2313	0.23	0.12
Total PCBs (Congeners)	-- - --	13 / 13	0.53	0.92	SD-A-46-0-0.5	0.67	0.71	0.13
Semivolatile Organic Compounds								
1,1-Biphenyl	0.015 - 0.022	9 / 73	0.044	15.1	SD-A-04-0-0.5	0.019	0.24	1.77
2,4,5-Trichlorophenol	0.046 - 0.070	0 / 73	--	--	--	0.06	0.029	0.0024
2,4,6-Trichlorophenol	0.026 - 0.040	0 / 73	--	--	--	0.0325	0.016	0.0014
2,4-Dichlorophenol	0.050 - 0.080	0 / 73	--	--	--	0.065	0.032	0.0028
2,4-Dimethylphenol	0.075 - 0.12	0 / 73	--	--	--	0.1	0.049	0.0042
2,4-Dinitrophenol	0.046 - 0.070	0 / 73	--	--	--	0.06	0.029	0.0025
2,4-Dinitrotoluene	0.035 - 0.055	0 / 73	--	--	--	0.045	0.022	0.0020
2,6-Dinitrotoluene	0.035 - 0.055	0 / 73	--	--	--	0.044	0.022	0.0018
2-Chloronaphthalene	0.043 - 0.065	0 / 73	--	--	--	0.055	0.027	0.0024
2-Chlorophenol	0.026 - 0.040	0 / 73	--	--	--	0.033	0.017	0.0014
2-Methylnaphthalene	0.021 - 0.030	14 / 73	0.044	70.7	SD-A-04-0-0.5	0.026	1.05	8.27
2-Methylphenol	0.030 - 0.046	0 / 73	--	--	--	0.038	0.019	0.0016
2-Nitroaniline	0.019 - 0.030	0 / 73	--	--	--	0.0245	0.012	0.0010
2-Nitrophenol	0.038 - 0.060	0 / 73	--	--	--	0.048	0.024	0.0020
3 and 4-Methylphenol	0.044 - 0.065	0 / 73	--	--	--	0.055	0.027	0.0024
3,3'-Dichlorobenzidine	0.029 - 0.045	0 / 73	--	--	--	0.037	0.018	0.0015
3-Nitroaniline	0.024 - 0.036	0 / 73	--	--	--	0.03	0.015	0.0012
4,6-Dinitro-2-methylphenol	0.027 - 0.041	0 / 73	--	--	--	0.0335	0.017	0.0014
4-Bromophenyl-phenylether	0.016 - 0.024	0 / 73	--	--	--	0.0195	0.0098	8.22E-04
4-Chloro-3-methylphenol	0.039 - 0.060	0 / 73	--	--	--	0.049	0.024	0.0021
4-Chloroaniline	0.019 - 0.029	0 / 73	--	--	--	0.024	0.012	9.90E-04

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2a
Statistical Summary of OU2 Surface Sediment (0 to 0.5 feet) Results
Groups A and B
Quanta Resources Superfund Site, Edgewater, New Jersey

Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minmum Concentration Detected (mg/lg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg) [1]	Standard Deviation of Mean (mg/kg)
4-Chlorophenyl-phenylether	0.014 - 0.022	0 / 73	--	--	--	0.018	0.0091	7.67E-04
4-Nitroaniline	0.021 - 0.033	0 / 73	--	--	--	0.0265	0.013	0.0011
4-Nitrophenol	0.041 - 0.065	0 / 73	--	--	--	0.055	0.026	0.0023
Acenaphthene	6.00E-04 - 7.00E-04	67 / 73	0.016	62.1	SD-A-04-0-0.5	0.0576	1.27	7.42
Acenaphthylene	-- - --	73 / 73	0.043	7.28	SD-A-07-0-0.5	0.133	0.45	1.18
Acetophenone	0.019 - 0.030	0 / 73	--	--	--	0.0245	0.012	0.0010
Anthracene	-- - --	73 / 73	0.054	41.7	SD-A-04-0-0.5	0.199	1.16	4.98
Atrazine	0.026 - 0.041	0 / 73	--	--	--	0.0335	0.017	0.0014
Benzaldehyde	0.034 - 0.050	0 / 71	--	--	--	0.043	0.021	0.0017
Benzo(a)anthracene	-- - --	73 / 73	0.11	36.4	SD-A-04-0-0.5	0.477	2.27	6.09
Benzo(a)pyrene	-- - --	73 / 73	0.14	31.1	SD-A-04-0-0.5	0.537	2.15	5.29
Benzo(b)fluoranthene	-- - --	73 / 73	0.11	32.1	SD-A-04-0-0.5	0.6	2.05	5.04
Benzo(g,h,i)perylene	-- - --	73 / 73	0.048	15.4	SD-A-07-0-0.5	0.24	0.97	2.70
Benzo(k)fluoranthene	-- - --	73 / 73	0.096	19.6	SD-A-04-0-0.5	0.493	1.60	3.80
bis(2-Chloroethoxy)methane	0.020 - 0.030	0 / 73	--	--	--	0.025	0.012	0.0010
bis(2-Chloroethyl)ether	0.015 - 0.024	0 / 73	--	--	--	0.0195	0.0096	8.06E-04
bis(2-Chloroisopropyl)ether	0.023 - 0.035	0 / 73	--	--	--	0.029	0.014	0.0012
bis(2-Ethylhexyl)phthalate	0.047 - 0.050	69 / 73	0.12	2.98	SD-A-04-0-0.5	0.423	0.49	0.41
Butylbenzylphthalate	0.024 - 0.036	4 / 73	0.093	0.17	SD-A-36-0-0.5	0.03	0.020	0.025
Caprolactam	0.029 - 0.045	0 / 73	--	--	--	0.0375	0.019	0.0015
Carbazole	0.013 - 0.017	45 / 73	0.034	10.0	SD-A-04-0-0.5	0.0426	0.25	1.20
Chrysene	-- - --	73 / 73	0.13	32.0	SD-A-04-0-0.5	0.51	2.08	5.35
Dibenz(a,h)anthracene	-- - --	73 / 73	0.024	5.28	SD-A-07-0-0.5	0.15	0.41	0.96
Dibenzofuran	0.015 - 0.021	27 / 73	0.034	48.1	SD-A-04-0-0.5	0.019	0.83	5.64
Diethylphthalate	0.013 - 0.020	0 / 73	--	--	--	0.0165	0.0083	6.85E-04
Dimethyl phthalate	0.013 - 0.020	0 / 73	--	--	--	0.0165	0.0083	6.90E-04
Di-n-butylphthalate	0.019 - 0.030	0 / 73	--	--	--	0.0245	0.012	0.0010
Di-n-octylphthalate	0.026 - 0.040	2 / 73	0.18	0.53	SD-A-23-0-0.5	0.033	0.026	0.063
Fluoranthene	-- - --	73 / 73	0.18	92.5	SD-A-04-0-0.5	0.891	5.31	15.8
Fluorene	8.00E-04 - 8.00E-04	72 / 73	0.021	58.3	SD-A-04-0-0.5	0.065	1.05	6.83
Hexachlorobenzene	0.018 - 0.027	0 / 73	--	--	--	0.0225	0.011	9.25E-04
Hexachlorobutadiene	0.020 - 0.031	0 / 73	--	--	--	0.0255	0.013	0.0011
Hexachlorocyclopentadiene	0.022 - 0.034	0 / 69	--	--	--	0.028	0.014	0.0011
Hexachloroethane	0.015 - 0.024	0 / 73	--	--	--	0.0195	0.0097	7.96E-04
Indeno(1,2,3-cd)pyrene	-- - --	73 / 73	0.058	15.2	SD-A-04-0-0.5	0.297	1.00	2.68
Isophorone	0.015 - 0.023	0 / 73	--	--	--	0.019	0.0096	7.99E-04
Naphthalene	4.05E-04 - 5.00E-04	62 / 73	0.014	196	SD-A-04-0-0.5	0.0292	2.83	22.9
Nitrobenzene	0.021 - 0.033	0 / 73	--	--	--	0.027	0.013	0.0011
n-Nitroso-di-n-propylamine	0.020 - 0.030	0 / 73	--	--	--	0.025	0.012	0.0010
n-Nitrosodiphenylamine	0.013 - 0.020	0 / 73	--	--	--	0.016	0.0080	6.68E-04
Pentachlorophenol	0.034 - 0.050	0 / 73	--	--	--	0.0435	0.022	0.0017
Phenanthrene	-- - --	73 / 73	0.067	171	SD-A-04-0-0.5	0.369	3.68	20.2
Phenol	0.038 - 0.060	0 / 73	--	--	--	0.048	0.024	0.0020
Pyrene	-- - --	73 / 73	0.16	86.3	SD-A-04-0-0.5	0.867	4.44	12.8
Total HMWPAHs	-- - --	73 / 73	1.10	360	SD-A-04-0-0.5	4.789	22.3	60.0
Total LMWPAHs	-- - --	73 / 73	0.22	606	SD-A-04-0-0.5	0.8403	11.5	71.0
Total PAHs	-- - --	73 / 73	1.35	966	SD-A-04-0-0.5	5.7112	33.8	123

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2a
Statistical Summary of OU2 Surface Sediment (0 to 0.5 feet) Results
Groups A and B
Quanta Resources Superfund Site, Edgewater, New Jersey

Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minmum Concentration Detected (mg/lg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg) [1]	Standard Deviation of Mean (mg/kg)
Volatile Organic Compounds								
1,1,1-Trichloroethane	7.50E-04 - 0.12	0 / 47	--	--	--	0.07	0.036	0.0086
1,1,2,2-Tetrachloroethane	7.50E-04 - 0.11	0 / 47	--	--	--	0.07	0.035	0.0082
1,1,2-Trichloroethane	7.00E-04 - 0.10	0 / 47	--	--	--	0.065	0.032	0.0076
1,1,2-Trichlorotrifluoroethane	0.0011 - 0.17	0 / 47	--	--	--	0.105	0.052	0.012
1,1-Dichloroethane	6.00E-04 - 0.090	0 / 47	--	--	--	0.06	0.029	0.0067
1,1-Dichloroethene	9.00E-04 - 0.13	0 / 47	--	--	--	0.085	0.042	0.0099
1,2,4-Trichlorobenzene	4.55E-04 - 0.065	0 / 47	--	--	--	0.0425	0.021	0.0049
1,2-Dibromo-3-Chloropropane	0.0028 - 0.41	0 / 47	--	--	--	0.26	0.13	0.031
1,2-Dibromoethane	7.50E-04 - 0.11	0 / 47	--	--	--	0.07	0.034	0.0080
1,2-Dichlorobenzene	6.00E-04 - 0.085	0 / 47	--	--	--	0.055	0.027	0.0063
1,2-Dichloroethane	7.00E-04 - 0.11	0 / 47	--	--	--	0.065	0.033	0.0079
1,2-Dichloropropane	7.00E-04 - 0.11	0 / 47	--	--	--	0.065	0.034	0.0079
1,3-Dichlorobenzene	6.50E-04 - 0.095	0 / 47	--	--	--	0.06	0.029	0.0070
1,4-Dichlorobenzene	6.00E-04 - 0.085	0 / 47	--	--	--	0.055	0.028	0.0066
2-Butanone	0.0036 - 0.50	0 / 47	--	--	--	0.33	0.17	0.038
2-Hexanone	0.0018 - 0.26	0 / 47	--	--	--	0.165	0.083	0.019
4-Methyl-2-pentanone	0.0026 - 0.38	0 / 47	--	--	--	0.24	0.12	0.028
Acetone	0.21 - 0.55	1 / 47	0.055	0.055	SD-B-13-0-0.5	0.345	0.17	0.036
Benzene	6.00E-04 - 0.090	0 / 47	--	--	--	0.06	0.029	0.0067
Bromodichloromethane	6.00E-04 - 0.085	0 / 47	--	--	--	0.055	0.028	0.0065
Bromoform	5.50E-04 - 0.085	0 / 47	--	--	--	0.05	0.026	0.0064
Bromomethane	4.80E-04 - 0.070	0 / 47	--	--	--	0.0445	0.023	0.0053
Carbon Disulfide	7.00E-04 - 0.11	9 / 47	0.13	0.30	SD-A-07-0-0.5	0.07	0.068	0.076
Carbon Tetrachloride	0.0013 - 0.18	0 / 47	--	--	--	0.115	0.058	0.014
Chlorobenzene	5.50E-04 - 0.080	0 / 47	--	--	--	0.05	0.026	0.0062
Chlorodibromomethane	7.00E-04 - 0.11	0 / 47	--	--	--	0.065	0.033	0.0078
Chloroethane	0.0023 - 0.33	0 / 47	--	--	--	0.21	0.11	0.025
Chloroform	7.50E-04 - 0.11	0 / 47	--	--	--	0.07	0.036	0.0084
Chloromethane	6.00E-04 - 0.090	0 / 47	--	--	--	0.055	0.028	0.0067
cis-1,2-dichloroethene	9.00E-04 - 0.13	0 / 47	--	--	--	0.08	0.041	0.0097
cis-1,3-dichloropropene	5.50E-04 - 0.080	0 / 47	--	--	--	0.05	0.025	0.0059
Cyclohexane	0.0017 - 0.25	0 / 47	--	--	--	0.155	0.078	0.018
Dichlorodifluoromethane	0.0011 - 0.15	0 / 47	--	--	--	0.095	0.048	0.011
Ethylbenzene	6.00E-04 - 0.085	1 / 47	0.39	0.39	SD-A-04-0-0.5	0.055	0.035	0.054
Isopropylbenzene	6.00E-04 - 0.090	0 / 47	--	--	--	0.055	0.028	0.0068
Methyl acetate	0.13 - 0.23	32 / 47	0.054	1.79	SD-A-34-0-0.5	0.54	0.56	0.45
Methyl-tert-butyl ether (MTBE)	7.50E-04 - 0.11	0 / 47	--	--	--	0.07	0.034	0.0080
Methylcyclohexane	8.50E-04 - 0.12	0 / 47	--	--	--	0.08	0.039	0.0091
Methylene Chloride	9.00E-04 - 0.13	0 / 47	--	--	--	0.085	0.042	0.0098
o-xylene	6.50E-04 - 0.095	1 / 47	0.17	0.17	SD-A-04-0-0.5	0.06	0.033	0.022
Styrene	4.25E-04 - 0.060	0 / 47	--	--	--	0.0395	0.020	0.0046
Tetrachloroethene	0.0011 - 0.16	0 / 47	--	--	--	0.1	0.050	0.012
Toluene	7.00E-04 - 0.11	0 / 47	--	--	--	0.065	0.033	0.0079
trans-1,2-Dichloroethene	9.00E-04 - 0.13	0 / 47	--	--	--	0.085	0.041	0.0099
trans-1,3-Dichloropropene	5.00E-04 - 0.075	0 / 47	--	--	--	0.0475	0.024	0.0056
Trichloroethene	7.00E-04 - 0.10	0 / 47	--	--	--	0.065	0.032	0.0074
Trichlorofluoromethane	9.50E-04 - 0.14	0 / 47	--	--	--	0.09	0.044	0.010
Vinyl chloride	8.50E-04 - 0.13	0 / 47	--	--	--	0.08	0.039	0.0093
Xylenes, m and p	0.0012 - 0.17	1 / 47	0.483	0.48	SD-A-04-0-0.5	0.105	0.062	0.064
Xylene, total	6.50E-04 - 0.095	1 / 47	0.66	0.66	SD-A-04-0-0.5	0.06	0.043	0.092
Other Parameters								
Total Organic Carbon	-- - --	66 / 66	19,800	51,800	SD-A-04-0-0.5	27,500	28,306	5,669

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2b
Statistical Summary of OU2 Subsurface Sediment (0.5 to 2.0 feet) Results
Groups A and B
Quanta Resources Superfund Site, Edgewater, New Jersey

Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minimum Concentration Detected (mg/kg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg)[1]	Standard Deviation of Mean (mg/kg)
Inorganics								
Arsenic	-- - --	26 / 26	9.2	49.7	SD-A-17-1.0-2.0	11.3	14.7	9.99
Chromium	-- - --	26 / 26	50.4	100	SD-B-24-1.0-2.0	75.7	74.6	11.9
Copper	-- - --	26 / 26	74.4	161	SD-A-17-1.0-2.0	98.05	102	19.6
Lead	-- - --	26 / 26	75.5	189	SD-A-17-1.0-2.0	90.55	99.4	25.4
Nickel	-- - --	26 / 26	26.1	57.9	SD-A-17-1.0-2.0	30.75	31.3	5.82
Silver	-- - --	26 / 26	2.1	5.40	SD-B-13-1.0-2.0	3.55	3.77	0.95
Zinc	-- - --	26 / 26	164	260	SD-B-24-1.0-2.0	184.5	194	23.9
Mercury	-- - --	26 / 26	0.71	3.10	SD-B-21-1.0-2.0	1.25	1.32	0.58
Pesticide/Polychlorinated Biphenyls								
Aroclor-1016	0.0028 - 0.0040	0 / 26	--	--	--	0.003275	0.0016	1.40E-04
Aroclor-1221	0.0090 - 0.013	0 / 26	--	--	--	0.0105	0.0052	4.50E-04
Aroclor-1232	0.0080 - 0.012	0 / 26	--	--	--	0.0095	0.0047	4.24E-04
Aroclor-1242	0.0047 - 0.0060	19 / 26	0.05	1.42	SD-B-13-0.5-1.0	0.112	0.16	0.27
Aroclor-1248	0.0050 - 0.0075	0 / 26	--	--	--	0.006	0.0030	2.78E-04
Aroclor-1254	0.0070 - 0.010	12 / 26	0.045	0.33	SD-B-13-0.5-1.0	0.00975	0.044	0.068
Aroclor-1260	0.0030 - 0.0041	4 / 26	0.057	0.16	SD-B-21-0.5-1.0	0.003475	0.017	0.039
Total PCBs (Aroclors)	-- - --	26 / 26	0.039	1.85	SD-B-13-0.5-1.0	0.14565	0.22	0.35
Total PCBs (Congeners)	-- - --	13 / 13	0.66601	1.09	SD-A-17-0.5-1.0	0.85566	0.85	0.16
Semivolatile Organic Compounds								
1,1-Biphenyl	0.015 - 0.033	2 / 26	0.097	1.87	SD-A-24-1.0-2.0	0.017	0.084	0.36
2,4,5-Trichlorophenol	0.045 - 0.11	0 / 26	--	--	--	0.0525	0.028	0.0072
2,4,6-Trichlorophenol	0.025 - 0.060	0 / 26	--	--	--	0.02925	0.016	0.0040
2,4-Dichlorophenol	0.050 - 0.12	0 / 26	--	--	--	0.06	0.031	0.0078
2,4-Dimethylphenol	0.075 - 0.18	0 / 26	--	--	--	0.09	0.048	0.012
2,4-Dinitrophenol	0.046 - 0.11	0 / 26	--	--	--	0.055	0.028	0.0071
2,4-Dinitrotoluene	0.035 - 0.080	0 / 26	--	--	--	0.04075	0.022	0.0053
2,6-Dinitrotoluene	0.034 - 0.080	0 / 26	--	--	--	0.03975	0.021	0.0054
2-Chloronaphthalene	0.042 - 0.095	0 / 26	--	--	--	0.049	0.026	0.0063
2-Chlorophenol	0.026 - 0.060	0 / 26	--	--	--	0.03	0.016	0.0040

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2b
Statistical Summary of OU2 Subsurface Sediment (0.5 to 2.0 feet) Results
Groups A and B
Quanta Resources Superfund Site, Edgewater, New Jersey

Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minimum Concentration Detected (mg/kg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg)[1]	Standard Deviation of Mean (mg/kg)
2-Methylnaphthalene	0.020 - 0.045	3 / 26	0.053	0.41	SD-B-24-1.0-2.0	0.023	0.034	0.081
2-Methylphenol	0.030 - 0.065	0 / 26	--	--	--	0.03425	0.018	0.0044
2-Nitroaniline	0.019 - 0.044	0 / 26	--	--	--	0.02225	0.012	0.0029
2-Nitrophenol	0.037 - 0.085	0 / 26	--	--	--	0.04325	0.023	0.0056
3 and 4-Methylphenol	0.043 - 0.10	0 / 26	--	--	--	0.04975	0.027	0.0068
3,3'-Dichlorobenzidine	0.029 - 0.065	0 / 26	--	--	--	0.03325	0.018	0.0045
3-Nitroaniline	0.023 - 0.055	0 / 26	--	--	--	0.02725	0.014	0.0036
4,6-Dinitro-2-methylphenol	0.026 - 0.060	0 / 26	--	--	--	0.0305	0.016	0.0039
4-Bromophenyl-phenylether	0.015 - 0.035	0 / 26	--	--	--	0.01775	0.0095	0.0024
4-Chloro-3-methylphenol	0.038 - 0.085	0 / 26	--	--	--	0.04425	0.024	0.0058
4-Chloroaniline	0.019 - 0.043	0 / 26	--	--	--	0.02175	0.012	0.0029
4-Chlorophenyl-phenylether	0.014 - 0.033	0 / 26	--	--	--	0.0165	0.0088	0.0022
4-Nitroaniline	0.021 - 0.048	0 / 26	--	--	--	0.02425	0.013	0.0032
4-Nitrophenol	0.041 - 0.095	0 / 26	--	--	--	0.04775	0.025	0.0064
Acenaphthene	5.00E-04 - 6.00E-04	22 / 26	0.0159	19.6	SD-A-24-1.0-2.0	0.02775	0.89	3.83
Acenaphthylene	-- - --	26 / 26	0.028	4.48	SD-A-24-1.0-2.0	0.10165	0.33	0.86
Acetophenone	0.019 - 0.044	0 / 26	--	--	--	0.022	0.012	0.0029
Anthracene	-- - --	26 / 26	0.037	14.0	SD-A-24-1.0-2.0	0.125	0.77	2.71
Atrazine	0.026 - 0.060	0 / 26	--	--	--	0.03025	0.016	0.0039
Benzaldehyde	0.033 - 0.075	0 / 22	--	--	--	0.03875	0.021	0.0056
Benzo(a)anthracene	-- - --	26 / 26	0.084	18.8	SD-A-24-1.0-2.0	0.2835	1.32	3.66
Benzo(a)pyrene	-- - --	26 / 26	0.089	14.7	SD-A-24-1.0-2.0	0.3385	1.19	2.86
Benzo(b)fluoranthene	-- - --	26 / 26	0.076	15.5	SD-A-24-1.0-2.0	0.38	1.20	3.00
Benzo(g,h,i)perylene	6.00E-04 - 6.00E-04	25 / 26	0.051	5.63	SD-A-24-1.0-2.0	0.14	0.41	1.08
Benzo(k)fluoranthene	-- - --	26 / 26	0.089	9.75	SD-A-24-1.0-2.0	0.2355	0.87	1.93
bis(2-Chloroethoxy)methane	0.019 - 0.045	0 / 26	--	--	--	0.0225	0.012	0.0030
bis(2-Chloroethyl)ether	0.015 - 0.035	0 / 26	--	--	--	0.0175	0.0093	0.0023
bis(2-Chloroisopropyl)ether	0.023 - 0.050	0 / 26	--	--	--	0.02625	0.014	0.0034
bis(2-Ethylhexyl)phthalate	0.039 - 0.046	21 / 26	0.11	1.21	SD-A-44-1.0-2.0	0.442	0.48	0.37
Butylbenzylphthalate	0.023 - 0.050	6 / 26	0.13	0.20	SD-A-36-1.0-2.0	0.027	0.045	0.059

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2b Statistical Summary of OU2 Subsurface Sediment (0.5 to 2.0 feet) Results Groups A and B Quanta Resources Superfund Site, Edgewater, New Jersey								
Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minimum Concentration Detected (mg/kg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg)[1]	Standard Deviation of Mean (mg/kg)
Caprolactam	0.029 - 0.065	0 / 26	--	--	--	0.03375	0.018	0.0045
Carbazole	0.013 - 0.027	9 / 26	0.031	0.57	SD-A-24-1.0-2.0	0.0155	0.045	0.11
Chrysene	-- - --	26 / 26	0.084	11.3	SD-A-24-1.0-2.0	0.2575	1.01	2.27
Dibenz(a,h)anthracene	-- - --	26 / 26	0.02	2.00	SD-A-24-1.0-2.0	0.0792	0.19	0.38
Dibenzofuran	0.014 - 0.031	6 / 26	0.029	9.25	SD-A-24-1.0-2.0	0.0165	0.38	1.81
Diethylphthalate	0.013 - 0.030	0 / 26	--	--	--	0.015	0.0080	0.0020
Dimethyl phthalate	0.013 - 0.030	0 / 26	--	--	--	0.015	0.0080	0.0020
Di-n-butylphthalate	0.019 - 0.044	0 / 26	--	--	--	0.02225	0.012	0.0030
Di-n-octylphthalate	0.026 - 0.060	1 / 26	0.23	0.23	SD-A-12-1.0-2.0	0.02975	0.024	0.042
Fluoranthene	-- - --	26 / 26	0.16	57.6	SD-A-24-1.0-2.0	0.459	3.23	11.2
Fluorene	6.50E-04 - 6.50E-04	24 / 26	0.016	17.4	SD-A-24-1.0-2.0	0.0466	0.76	3.40
Hexachlorobenzene	0.017 - 0.040	0 / 26	--	--	--	0.02025	0.011	0.0027
Hexachlorobutadiene	0.020 - 0.046	0 / 26	--	--	--	0.023	0.012	0.0031
Hexachlorocyclopentadiene	0.022 - 0.050	0 / 26	--	--	--	0.02525	0.013	0.0034
Hexachloroethane	0.015 - 0.035	0 / 26	--	--	--	0.0175	0.0093	0.0023
Indeno(1,2,3-cd)pyrene	-- - --	26 / 26	0.048	6.42	SD-A-24-1.0-2.0	0.172	0.49	1.23
Isophorone	0.015 - 0.034	0 / 26	--	--	--	0.0175	0.0093	0.0023
Naphthalene	4.15E-04 - 4.30E-04	23 / 26	0.014	1.23	SD-B-24-1.0-2.0	0.037	0.12	0.26
Nitrobenzene	0.021 - 0.048	0 / 26	--	--	--	0.02425	0.013	0.0032
n-Nitroso-di-n-propylamine	0.019 - 0.044	0 / 26	--	--	--	0.0225	0.012	0.0030
n-Nitrosodiphenylamine	0.013 - 0.029	0 / 26	--	--	--	0.0145	0.0077	0.0019
Pentachlorophenol	0.034 - 0.075	0 / 26	--	--	--	0.03925	0.021	0.0051
Phenanthrene	-- - --	26 / 26	0.068	79.7	SD-A-24-1.0-2.0	0.195	3.45	15.6
Phenol	0.037 - 0.085	0 / 26	--	--	--	0.04325	0.023	0.0056
Pyrene	-- - --	26 / 26	0.19	37.0	SD-A-24-1.0-2.0	0.5265	2.71	7.24
Total HMWPAHs	-- - --	26 / 26	0.85	179	SD-A-24-1.0-2.0	2.83415	12.6	34.6
Total LMWPAHs	-- - --	26 / 26	0.13	135	SD-A-24-1.0-2.0	0.55675	6.34	26.4
Total PAHs	-- - --	26 / 26	0.98	314	SD-A-24-1.0-2.0	3.3807	19.0	60.8
Volatile Organic Compounds								
1,1,1-Trichloroethane	8.00E-04 - 0.070	0 / 18	--	--	--	0.055	0.026	0.0096

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2b Statistical Summary of OU2 Subsurface Sediment (0.5 to 2.0 feet) Results Groups A and B Quanta Resources Superfund Site, Edgewater, New Jersey								
Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minimum Concentration Detected (mg/kg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg)[1]	Standard Deviation of Mean (mg/kg)
1,1,2,2-Tetrachloroethane	8.00E-04 - 0.065	0 / 18	--	--	--	0.055	0.025	0.0092
1,1,2-Trichloroethane	7.50E-04 - 0.060	0 / 18	--	--	--	0.05	0.023	0.0085
1,1,2-Trichlorotrifluoroethane	0.0012 - 0.10	0 / 18	--	--	--	0.08	0.037	0.014
1,1-Dichloroethane	6.50E-04 - 0.055	0 / 18	--	--	--	0.045	0.021	0.0077
1,1-Dichloroethene	9.50E-04 - 0.080	0 / 18	--	--	--	0.065	0.030	0.011
1,2,4-Trichlorobenzene	4.85E-04 - 0.041	0 / 18	--	--	--	0.033	0.015	0.0056
1,2-Dibromo-3-Chloropropane	0.0030 - 0.25	0 / 18	--	--	--	0.2025	0.093	0.034
1,2-Dibromoethane	8.00E-04 - 0.065	0 / 18	--	--	--	0.0525	0.024	0.0089
1,2-Dichlorobenzene	6.50E-04 - 0.055	0 / 18	--	--	--	0.043	0.020	0.0074
1,2-Dichloroethane	7.50E-04 - 0.065	0 / 18	--	--	--	0.05	0.023	0.0088
1,2-Dichloropropane	7.50E-04 - 0.065	0 / 18	--	--	--	0.0525	0.024	0.0089
1,3-Dichlorobenzene	6.50E-04 - 0.055	0 / 18	--	--	--	0.046	0.021	0.0078
1,4-Dichlorobenzene	6.50E-04 - 0.055	0 / 18	--	--	--	0.04325	0.020	0.0074
2-Butanone	0.22 - 0.32	2 / 18	0.045	0.054	SD-B-13-1.0-2.0	0.2575	0.12	0.029
2-Hexanone	0.0019 - 0.16	0 / 18	--	--	--	0.1275	0.058	0.022
4-Methyl-2-pentanone	0.0028 - 0.23	0 / 18	--	--	--	0.1875	0.086	0.032
Acetone	0.23 - 0.34	2 / 18	0.139	0.16	SD-B-13-1.0-2.0	0.2675	0.14	0.014
Benzene	6.50E-04 - 0.055	0 / 18	--	--	--	0.045	0.021	0.0077
Bromodichloromethane	6.50E-04 - 0.055	0 / 18	--	--	--	0.043	0.020	0.0074
Bromoform	6.00E-04 - 0.050	0 / 18	--	--	--	0.041	0.019	0.0069
Bromomethane	5.00E-04 - 0.043	0 / 18	--	--	--	0.03475	0.016	0.0059
Carbon Disulfide	0.044 - 0.065	7 / 18	0.0036	0.40	SD-A-17-0.5-1.0	0.055	0.094	0.13
Carbon Tetrachloride	0.0013 - 0.11	0 / 18	--	--	--	0.09	0.041	0.015
Chlorobenzene	6.00E-04 - 0.050	0 / 18	--	--	--	0.0405	0.019	0.0069
Chlorodibromomethane	7.50E-04 - 0.065	0 / 18	--	--	--	0.05	0.024	0.0088
Chloroethane	0.0024 - 0.21	0 / 18	--	--	--	0.1625	0.075	0.028
Chloroform	8.00E-04 - 0.070	0 / 18	--	--	--	0.055	0.025	0.0095
Chloromethane	6.50E-04 - 0.055	0 / 18	--	--	--	0.0435	0.020	0.0074
cis-1,2-dichloroethene	9.50E-04 - 0.080	0 / 18	--	--	--	0.0625	0.029	0.011
cis-1,3-dichloropropene	5.50E-04 - 0.048	0 / 18	--	--	--	0.039	0.018	0.0066

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-2b Statistical Summary of OU2 Subsurface Sediment (0.5 to 2.0 feet) Results Groups A and B Quanta Resources Superfund Site, Edgewater, New Jersey								
Analyte	Range of Non-Detect Values (mg/kg)	Frequency of Detection	Minimum Concentration Detected (mg/kg)	Maximum Concentration Detected (mg/kg)	Sample ID of Maximum Detected Concentration	Median (mg/kg)	Arithmetic Mean (mg/kg)[1]	Standard Deviation of Mean (mg/kg)
Cyclohexane	0.0018 - 0.15	0 / 18	--	--	--	0.12	0.055	0.021
Dichlorodifluoromethane	0.0011 - 0.095	0 / 18	--	--	--	0.075	0.034	0.013
Ethylbenzene	6.00E-04 - 0.050	0 / 18	--	--	--	0.0425	0.019	0.0072
Isopropylbenzene	6.50E-04 - 0.055	0 / 18	--	--	--	0.0435	0.020	0.0074
Methyl acetate	0.13 - 0.17	10 / 18	0.019	0.83	SD-A-26-1.0-2.0	0.16	0.21	0.21
Methyl-tert-butyl ether (MTBE)	7.50E-04 - 0.065	0 / 18	--	--	--	0.0525	0.024	0.0089
Methylcyclohexane	9.00E-04 - 0.075	1 / 18	0.19	0.19	SD-A-17-1.0-2.0	0.06	0.037	0.039
Methylene Chloride	9.50E-04 - 0.080	0 / 18	--	--	--	0.065	0.030	0.011
o-xylene	7.00E-04 - 0.055	0 / 18	--	--	--	0.0465	0.021	0.0078
Styrene	4.50E-04 - 0.038	0 / 18	--	--	--	0.03075	0.014	0.0052
Tetrachloroethene	0.0012 - 0.095	0 / 18	--	--	--	0.0775	0.035	0.013
Toluene	7.50E-04 - 0.065	0 / 18	--	--	--	0.05	0.023	0.0088
trans-1,2-Dichloroethene	9.50E-04 - 0.080	0 / 18	--	--	--	0.065	0.030	0.011
trans-1,3-Dichloropropene	5.50E-04 - 0.046	0 / 18	--	--	--	0.037	0.017	0.0063
Trichloroethene	7.00E-04 - 0.060	0 / 18	--	--	--	0.049	0.022	0.0082
Trichlorofluoromethane	0.0010 - 0.085	0 / 18	--	--	--	0.07	0.031	0.012
Vinyl chloride	9.00E-04 - 0.075	0 / 18	--	--	--	0.06	0.028	0.010
Xylenes, m and p	0.0012 - 0.10	0 / 18	--	--	--	0.0825	0.038	0.014
Xylene, total	7.00E-04 - 0.055	0 / 18	--	--	--	0.0465	0.021	0.0078
Other Parameters								
Total Organic Carbon	-- - --	26 / 26	23,400	52,700	SD-A-42-0.5-1.0	27,050	29,023	6,364

1 - One-half of the reporting limit was used for non-detected samples when calculating the mean.

Table 3-3
Summary of Statistical Comparisons of the Surface Sediment Sample Groups
Quanta Resource Superfund Site, Edgewater, New Jersey

	p[KW] [1]	Direction of Differences
Inorganics		
Arsenic	0.004	North Area > Upriver, Area A, Area B, Downriver
Chromium	0.002	Upriver > Area A, Area B, Downriver > North Area
Copper	0.117	NS
Lead	0.558	NS
Nickel	0.001	Upriver > Area A, Area B, Downriver > North Area
Silver	0.002	Upriver > Area B, Downriver, Area A, North Area
Zinc	0.097	NS
Mercury	0.033	Downriver > Upriver, Area B, Area A > North Area
Organics		
Total PAHs	<0.001	Area A > North Area, Downriver, Area B > Upriver
Total HMWPAH	<0.001	Area A > North Area, Downriver, Area B > Upriver
Total LMWPAH	<0.001	Area A > North Area, Downriver, Area B > Upriver
Total PCB	0.193	NS
Bis(2-ethylhexylphthalate	0.022	Area A, Upriver, North Area > Downriver, Area B
Carbazole	<0.001	Area A, North Area > Downriver, Area B > Upriver

[1] Probability of Kruskal-Wallis test statistic.
PAH = polynuclear aromatic hydrocarbons
HMWPAH = high moecular weight polynuclear aromatic hydrocarbons
LMWPAH = low molecular weight polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyl; total PCB = sum of Aroclors
NS = not significant

Table 3-4. Point Estimates of Upriver PCOI Concentrations

Quanta Resources Superfund Site, Edgewater, New Jersey

	Distribution	50th percentile (mg/kg)	95th percentile (mg/kg)	95UCL of 50th percentile (mg/kg)
Inorganics				
Arsenic	N	11.2	14.9	12.8
Chromium	NP	74.4	139	63.4
Copper	N	93.3	138	113
Nickel	N	35.3	40.6	37.6
Lead	N	88.6	125	105
Silver	N	3.02	5.03	3.89
Zinc	N	198	248	220
Organics				
Total PAHs	N	1.87	2.86	2.30
Total HMWPAH	N	1.63	2.46	1.99
Total LMWPAH	N	0.241	0.403	0.311
Total PCBs	NP	0.284	39.1	0.60

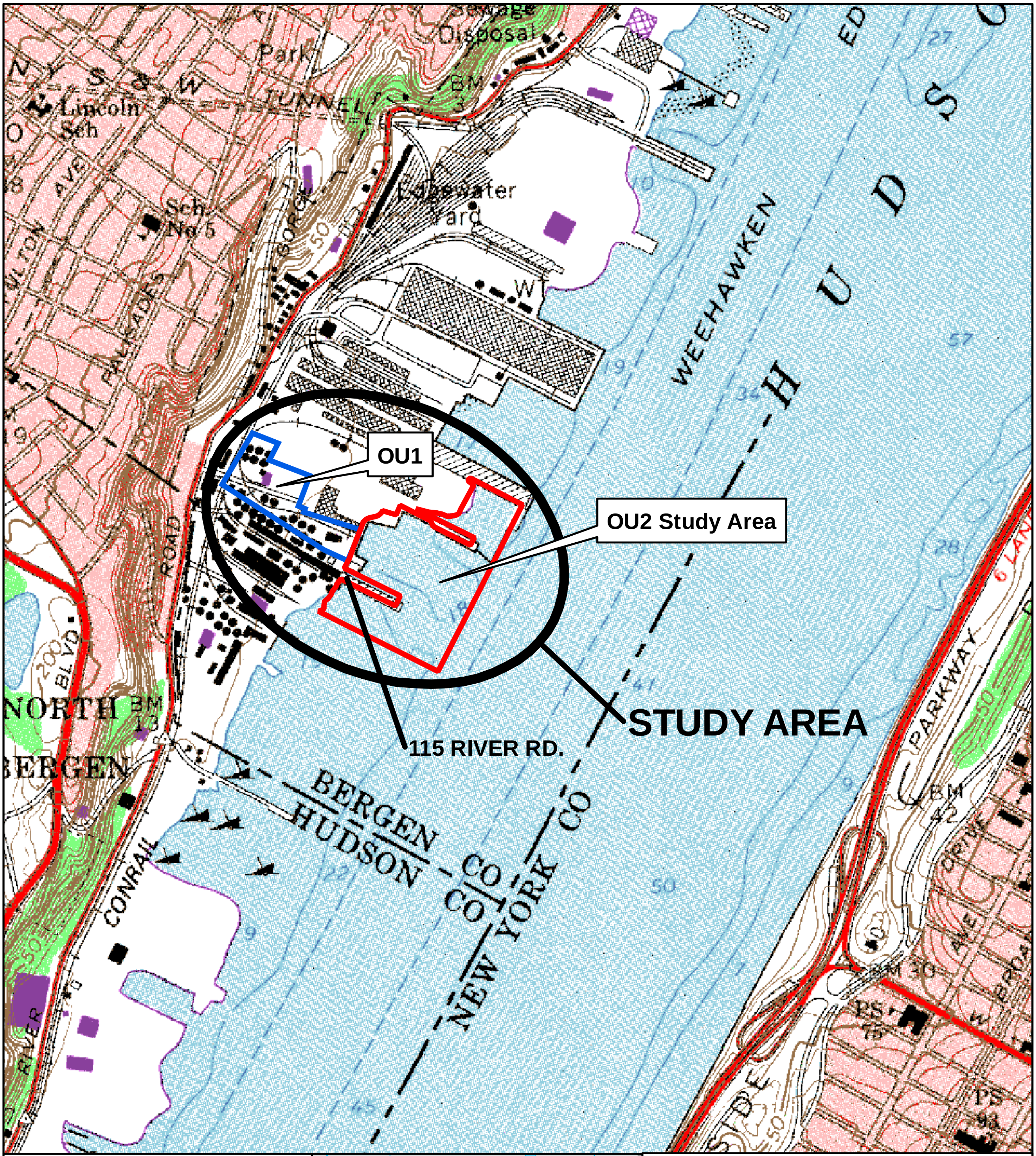
UCL = upper confidence limit
PAH = polynuclear aromatic hydrocarbons
HMWPAH = high moecular weight polynuclear aromatic hydrocarbons
LMWPAH = low molecular weight polynuclear aromatic hydrocarbons
PCB = polychlorinated biphenyl; total PCB = sum of Aroclors

Table 3-5. Comparison of Upriver Sample Results with Data From Previous Studies
Quanta Resources Superfund Site, Edgewater, New Jersey

			50th percentile (mg/kg)	
Program	Year	n	Total PAH	Arsenic
New York/New Jersey Harbor Estuary Program	2000-2001	4	2.98	12.5
NOAA National Status and Trends	1993	4	4.07	11.6
OU2 Upriver Samples	2006	10	1.87	11.2

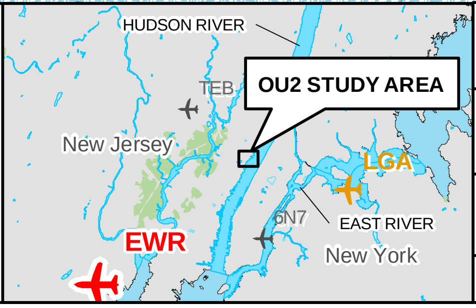
n = number of samples

Figures



Map Source:
Central Park, NY-NJ,
U.S.G.S.
7.5 Min. Quad

0 500 1,000
Feet



CH2MHILL

Study Area Location Map

Quanta Resources Superfund Site
Edgewater, New Jersey

7/05/2007

FIGURE 1-1

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\1-01_Study_Area_Location_Map.mxd, Date: July 6, 2007, User: MPETERSH

Legend

Sample Location Descriptions

- TarGOST
- Targost Confirmatory Sampling
- Operable Unit 2 Study Area
- Quanta Resources Property Boundary (Operable Unit 1)

CH2MHILL

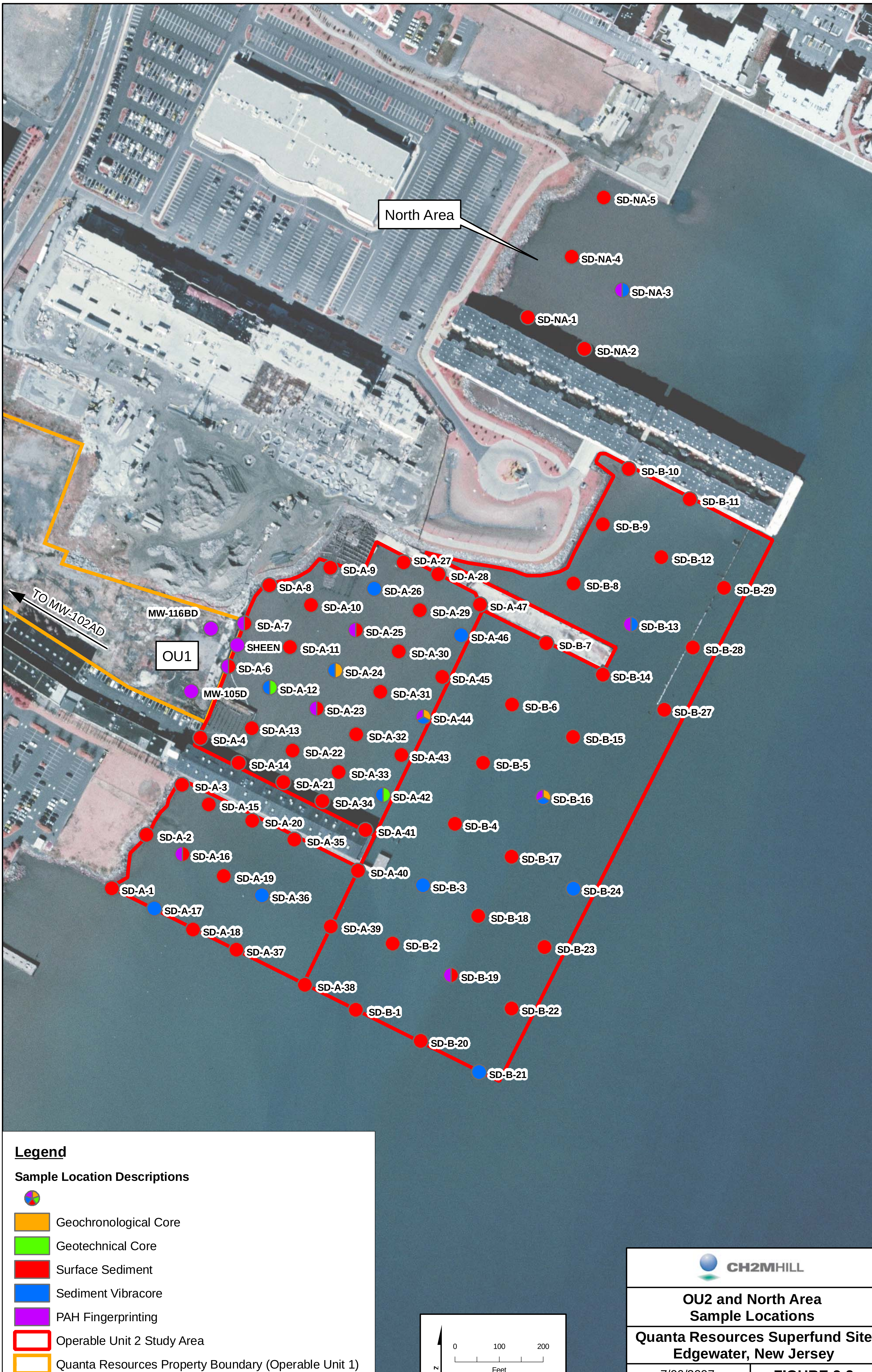
TarGOST™ Survey Sample Locations

Quanta Resources Superfund Site Edgewater, New Jersey

7/06/2007

FIGURE 2-1

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\2-01_Honeywell_TarGOST_SampleLocations.mxd, Date: July 6, 2007, User: MPETERSH



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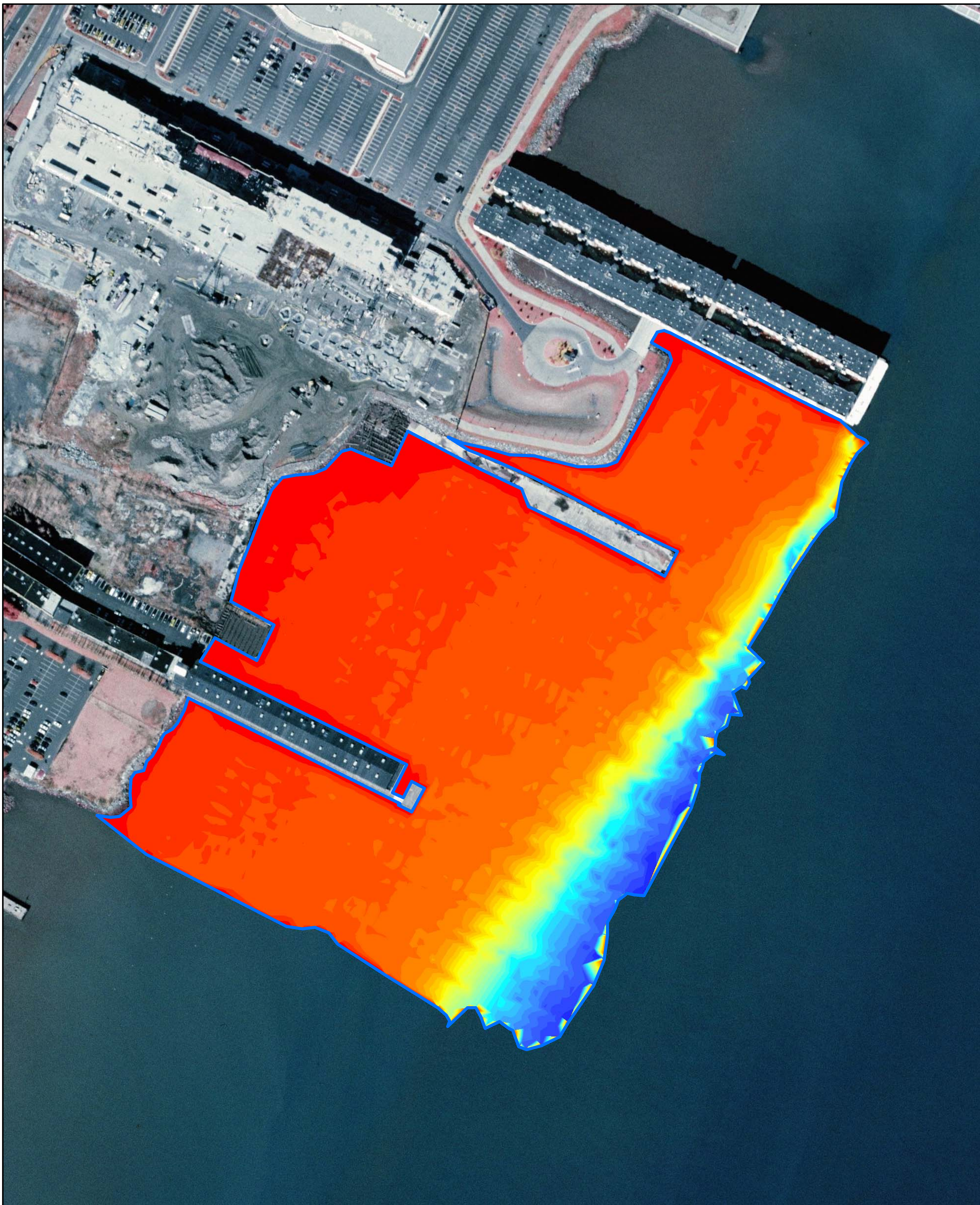


CH2MHILL

Bathymetric Map

Quanta Resources Superfund Site
Edgewater, New Jersey

7/06/2007

FIGURE 3-1

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\3-01_Honeywell_Quanta_Bathymetric_Data.mxd, Date: July 6, 2007, User: MPETERSH

DRAFT

LEGEND

A-30 3.47 — OU2 TarGOST™ BORING LOCATION WITH MAX %RE RESPONSE

CURRENT QUANTA RESOURCES PROPERTY BOUNDARY

AREA NOT SURVEYED DUE TO ACCESS LIMITATIONS; PRESENCE OF COAL TAR IS SUSPECTED

OU1 TarGOST™ RESPONSES

- 50%RE - 100%RE
- 100%RE- 200%RE
- 200%RE- 300%RE
- 300%RE - 400%RE
- 400%RE - 500%RE
- 500%RE- 600%RE
- 600%RE - 700%RE
- 700%RE - 800%RE
- 800%RE - 900%RE
- > 900%RE

OU2 TarGOST™ RESPONSES

- 6.7%RE - 15%RE
- 15%RE- 50%RE
- 50%RE- 100%RE
- 100%RE - 150%RE
- > 150%RE

GRAPHIC SCALE

40 0 40 80 160

(IN FEET)
1 inch = 80 ft.

NOTES:

1. TarGOST™ results are reported as a percent of a reference emitter (%RE) that is used to calibrate the tool prior to the completion of each boring location.
2. Due to differences in the matrix TarGOST™ responses in sediment at OU2 are reported as a pure fluorescense and are not normalized using a scatter response channel (representative of the reflectivity of the sediment).
3. Depiction of other properties on this figure is for comparative purposes and does not neccessarily suggest that site-related constituents have migrated there.
4. Additional historic soil sampling locations exist on the Edgewater Enterprises property. The representativeness of these points is questionable due to ongoing redevelopment taking place at this property.

Basemap Sources:

a.) Boundary and topographic survey of Block 95, Lot 1 and Block 93, Lots 1,2, and 3 performed by Vargo Associates in September 2005 and updated as recently as September 2006.
b.) Borough of Edgewater Tax Map - November, 1959
c.) Coal Tar Engineering Design Report (Environ, July 2005)
d.) Site Investigation Report, Part 4 (Langan, May 2004) for the former Lever Bros. Property.

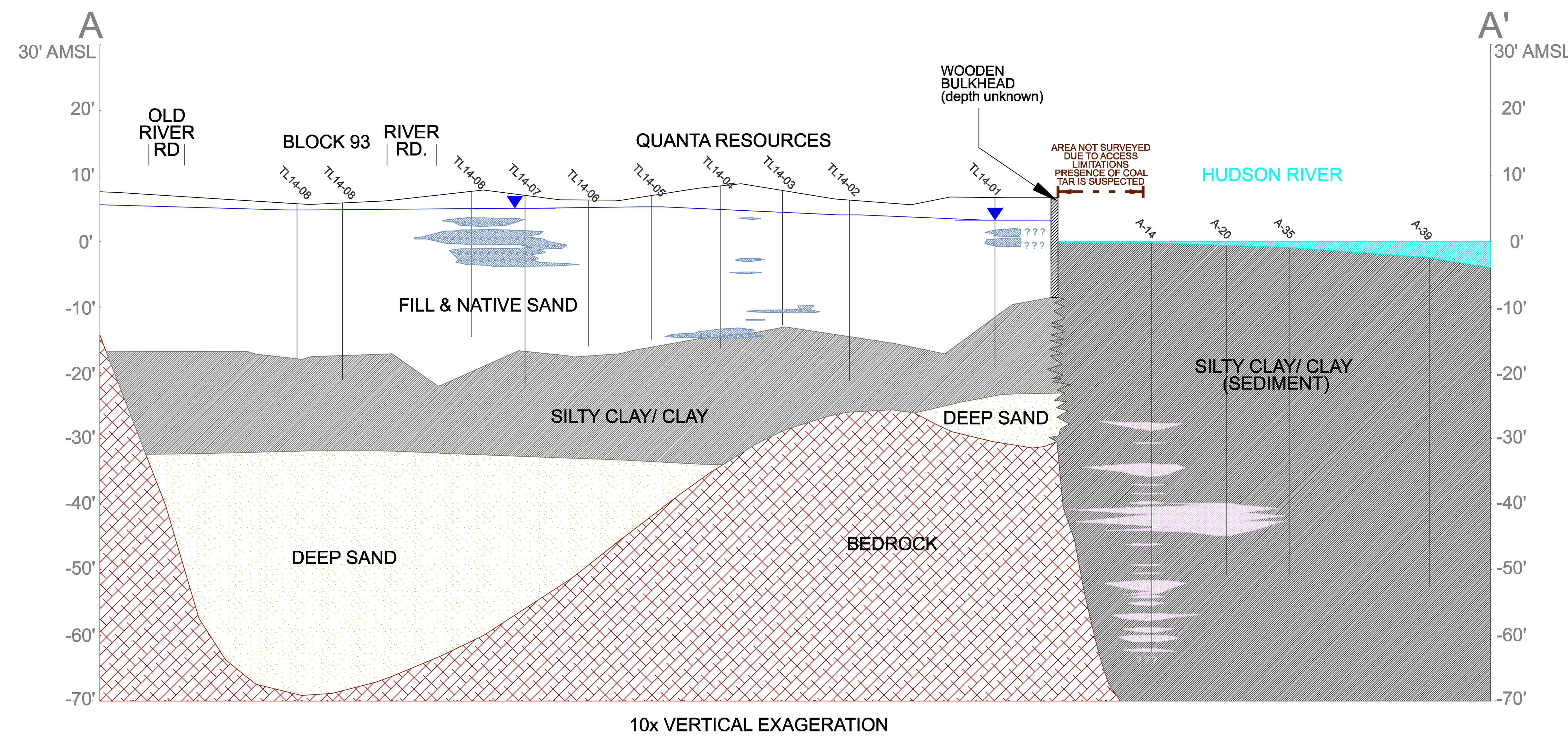
CH2MHILL

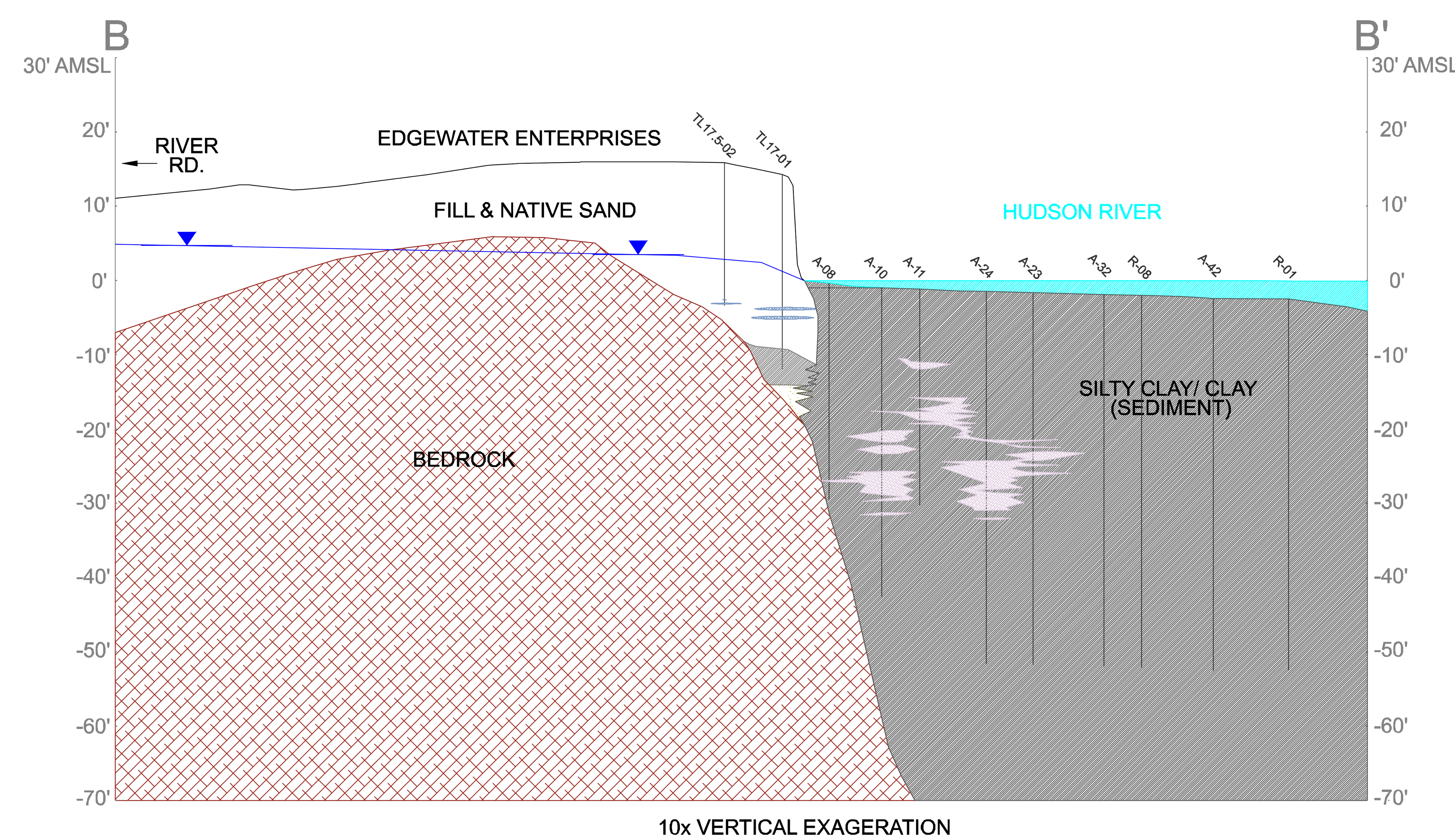
MAXIMUM TarGOST™ RESPONSE AT OU1 & OU2 SURVEY LOCATIONS

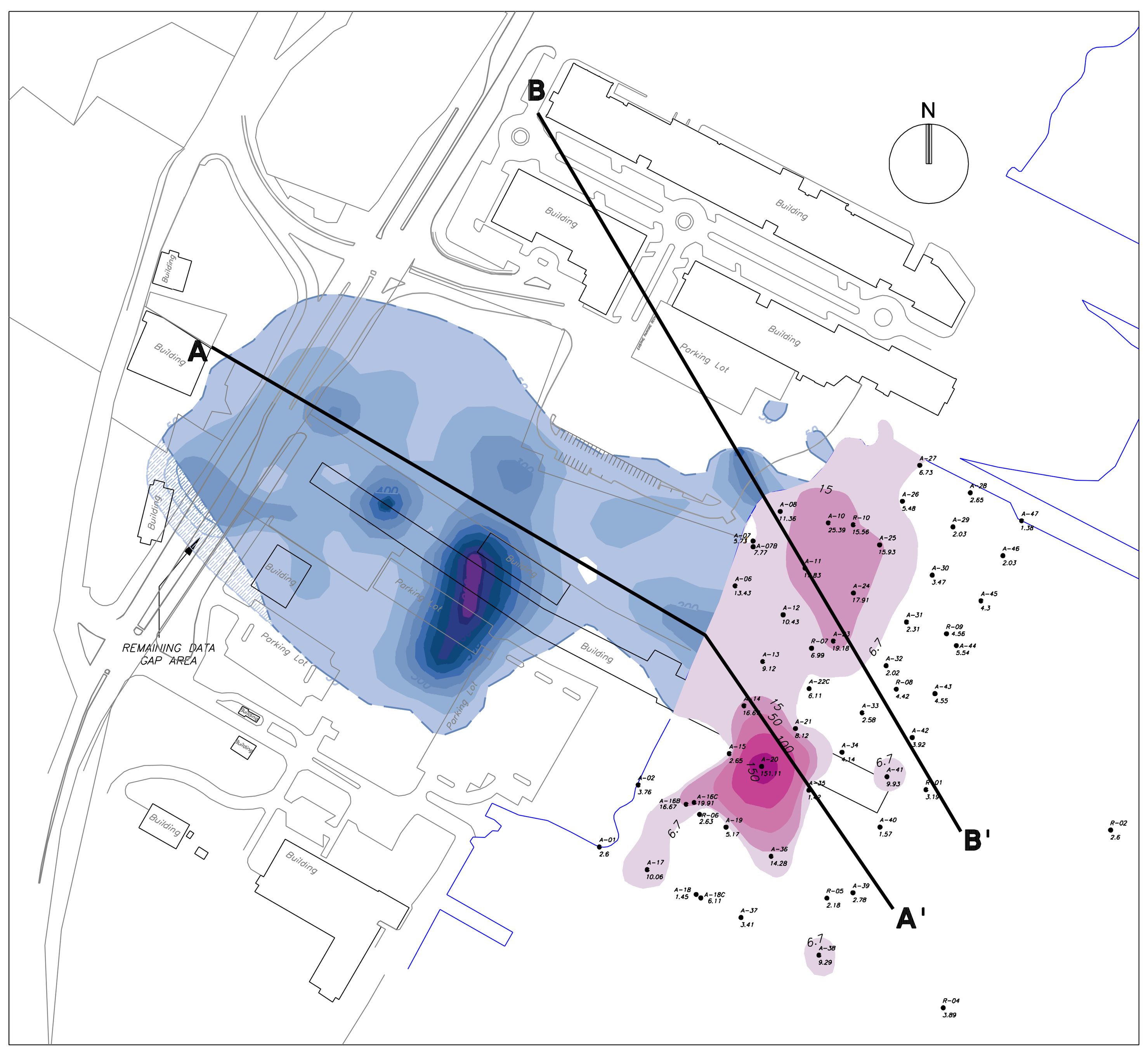
Quanta Resources Superfund Site
Edgewater, New Jersey

July 8, 2007 | FIGURE 3-2

si-targost-results-dsize-whatch-ou2.dgn







CROSS-SECTION LOCATIONS (PLAN VIEW)

GRAPHIC SCALE
(IN FEET)
1 inch = 250 ft.

LEGEND

- SHALLOW GROUNDWATER SURFACE
- FILL & NATIVE SAND
- SILTY-CLAY/ CLAY
- SILTY-CLAY/ CLAY (SEDIMENT)
- DEEP SAND
- BEDROCK
- OU1 TarGOST™ Response (50%RE or greater)
- OU2 TarGOST™ Response [6.7%RE or greater (fluorescence response only)]

NOTES:
1.) Plan view shows depiction of 2D contouring of TarGOST™ results at or greater than a 50%RE response. Additional detail provided in Figure 3-2 of the OU2 Draft Preliminary Site Characterization Report (CH2M Hill, 2007).

Basemap Sources:
a.) Boundary and topographic survey of Block 95, Lot 1 and Block 93, Lots 1,2, and 3 performed by Vargo Associates in September 2005 and updated as recently as September 2006.
b.) Borough of Edgewater Tax Map - November, 1959
c.) Coal Tar Engineering Design Report (Environ, July 2005)
d.) Site Investigation Report, Part 4 (Langan, May 2004) for the former Lever Bros. Property.

GRAPHIC SCALE
80 0 80 160 320
(IN FEET)
1 inch = 160 ft.
(10x vertical exageration)

DRAFT

CH2MHILL

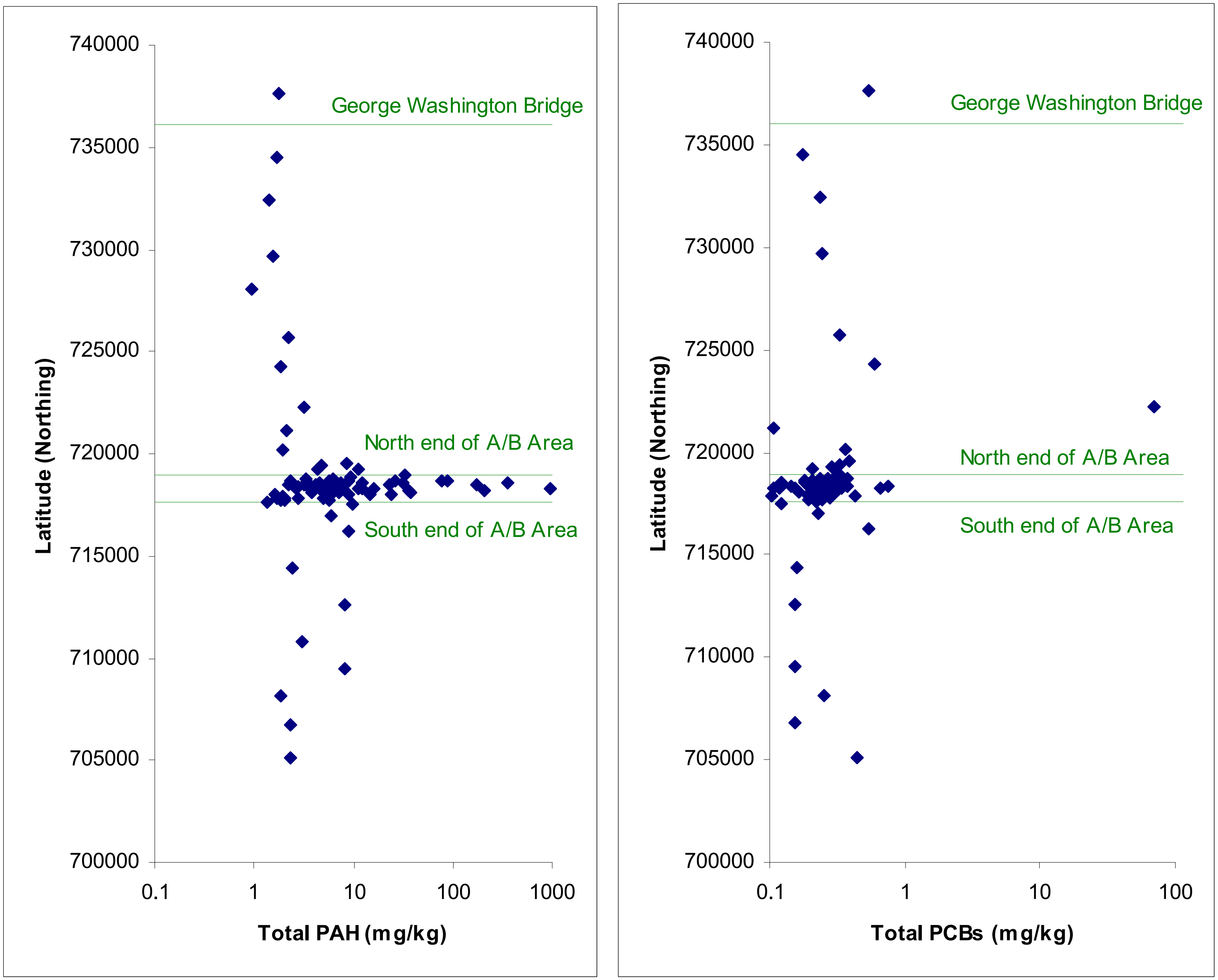
CROSS-SECTIONS
SHOWING COAL TAR DISTRIBUTION AT OU1 & OU2
BASED ON TarGOST™

Quanta Resources Superfund Site - OU2
Edgewater, New Jersey

July 16, 2007

FIGURE 3-3

targost-sectionplan-ou2.dgn

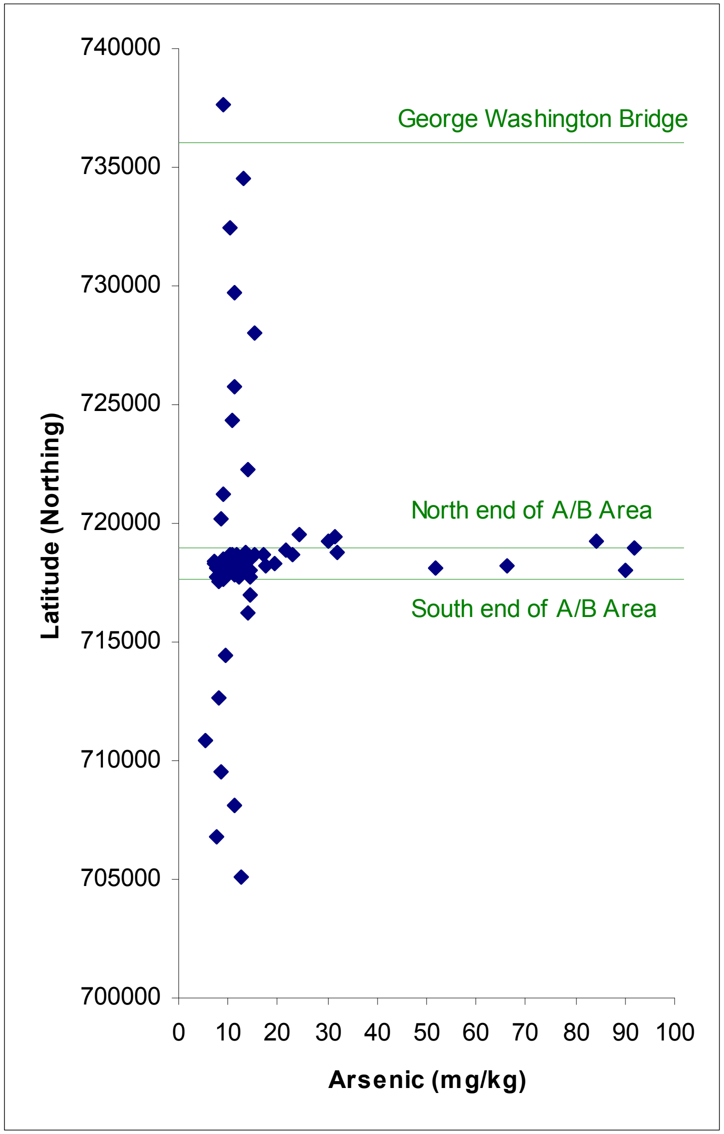


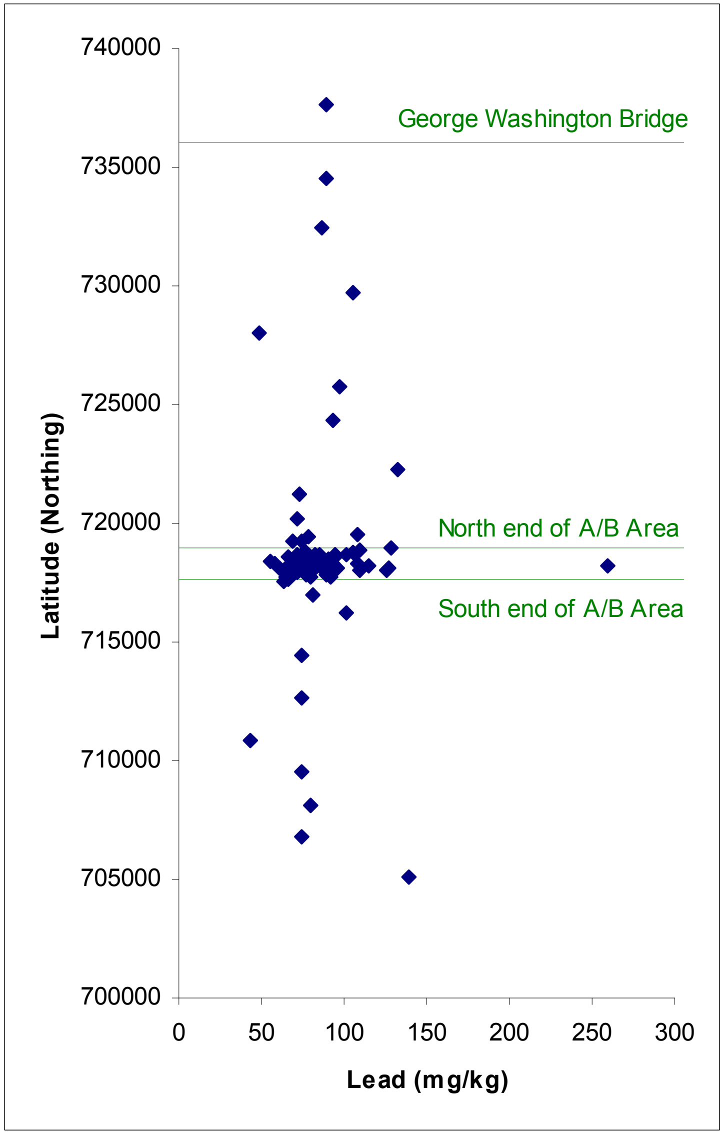
CH2MHILL

Total PAHs and Total PCBs in Surface Sediment with River Mile

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-4



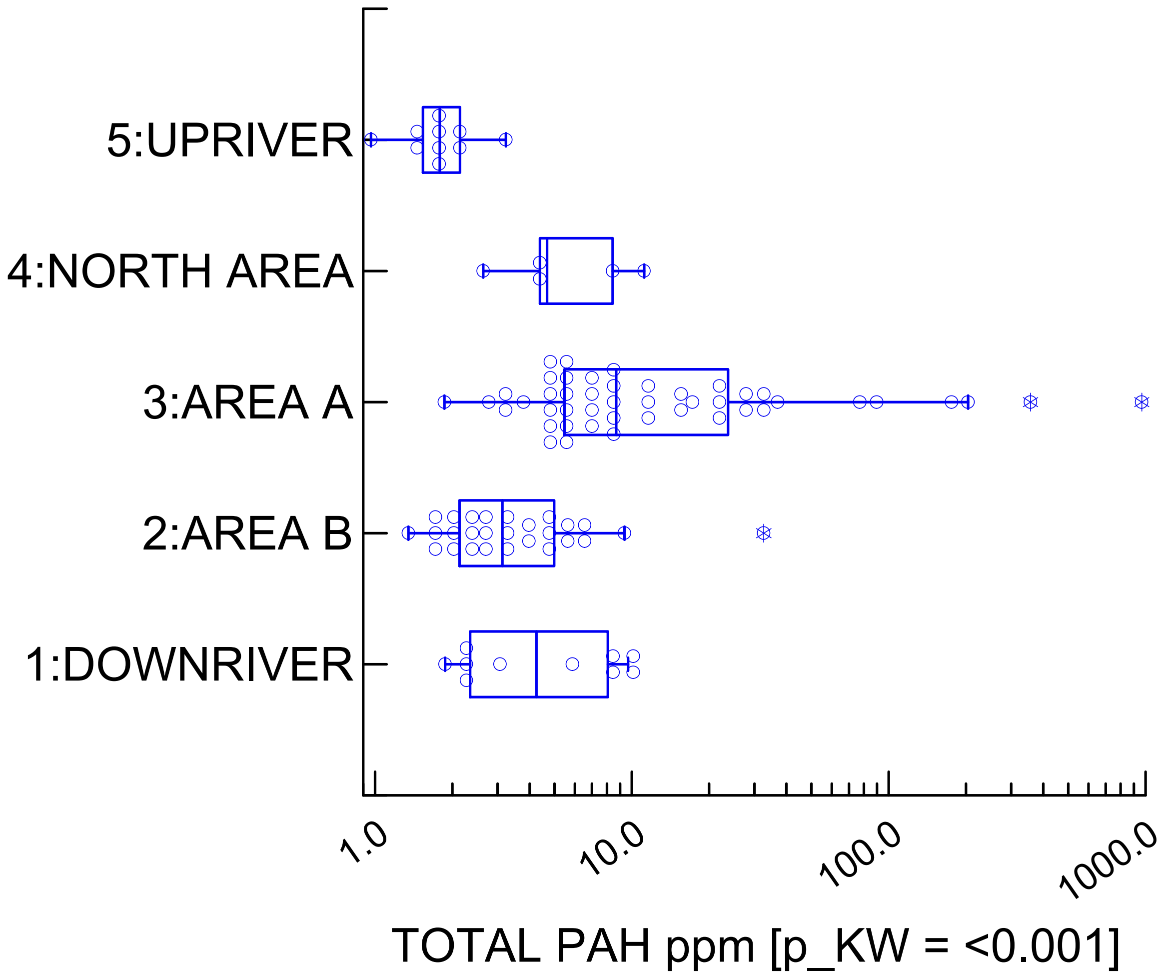


CH2MHILL

Arsenic and Lead in Surface Sediment with River Mile

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-5



A box plot identifies the median (50th percentile), the lower and upper quartiles (25th and 75th percentiles), and the range (spread of the data). The box demarcates the interquartile range (middle 50% of the data). The lines, or whiskers, extend through the range of the data, excluding outliers. Outliers lie more than 1.5 times the interquartile range from the nearest edge of the box. If the probability of the Kruskal-Wallis test statistic (p_KW) is < 0.05, then the null hypothesis that the sample groups are equal cannot be supported.

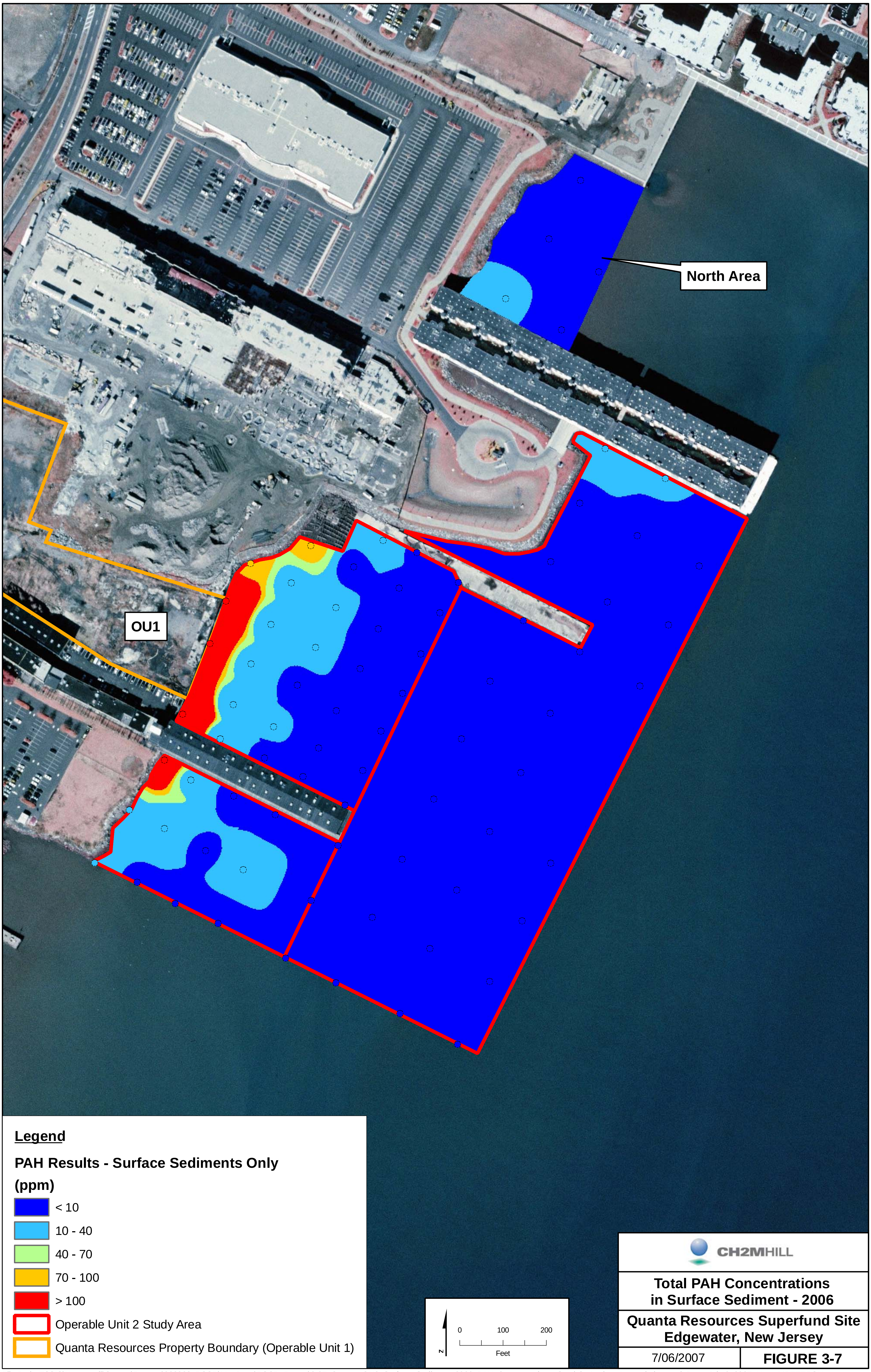
CH2MHILL

Box Plot of Total PAH Results for Surface Sediment

Quanta Resources Superfund Site

Edgewater, New Jersey

FIGURE 3-6



Total PAH Concentrations in Surface Sediment - 2006

Quanta Resources Superfund Site Edgewater, New Jersey

7/06/2007

FIGURE 3-7

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\3-07_Quanta_OU2_Surface_Sediment_2006_PAH_Concentrations_Spatial _Analyst_Interpolation.mxd, Date: July 6, 2007, User: MPETERSH

Legend

PAH Results - 1995 - 2006 (ppm)

- < 10
- 10 - 40
- 40 - 70
- 70 - 100
- > 100
- Operable Unit 2 Study Area
- Quanta Resources Property Boundary (Operable Unit 1)

CH2MHILL

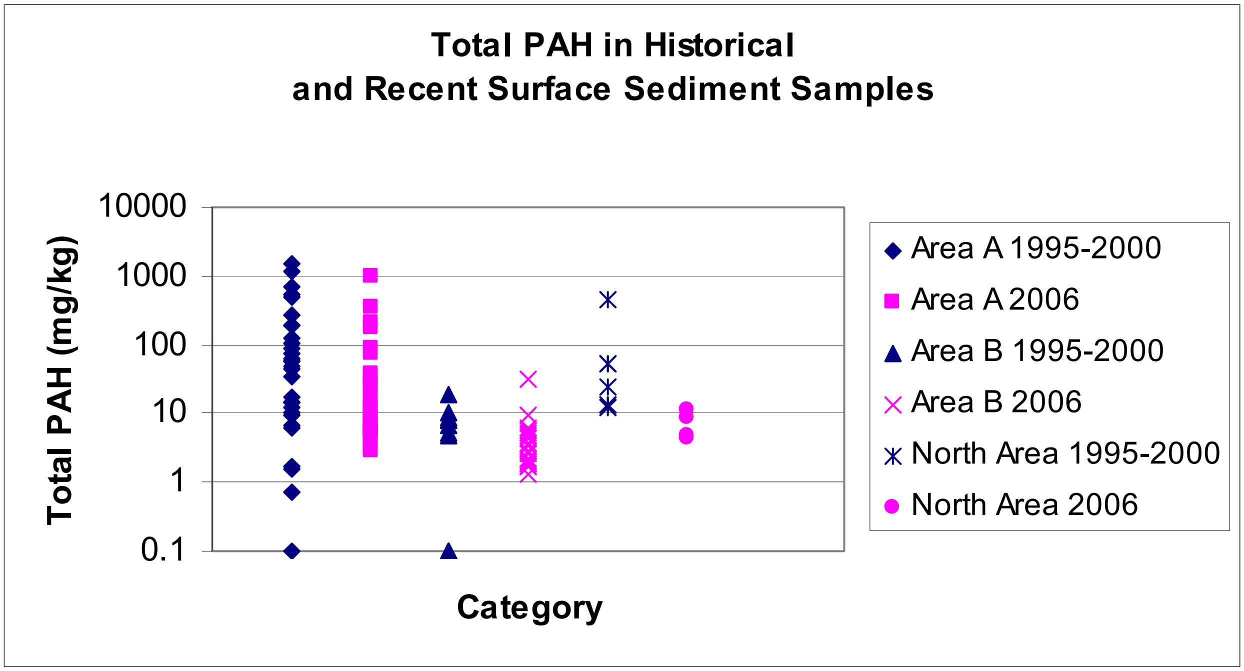
Total PAH Concentrations in Surface Sediment - 1995 - 2006

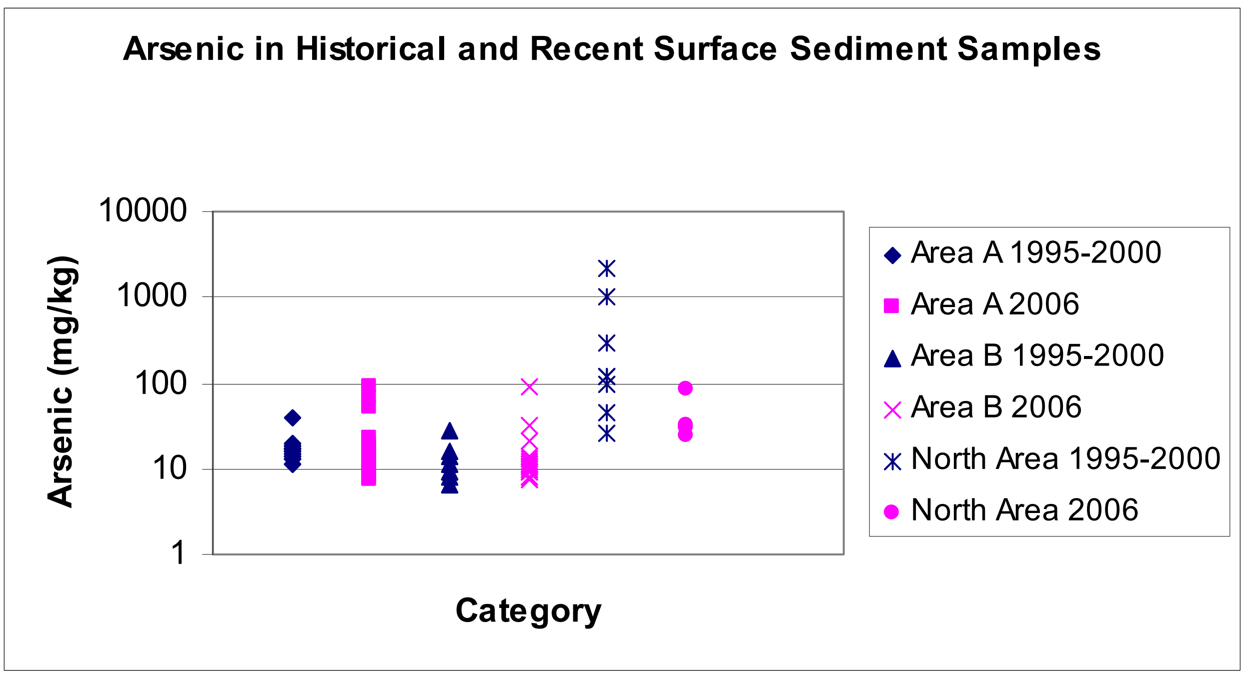
Quanta Resources Superfund Site Edgewater, New Jersey

7/06/2007

FIGURE 3-8

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\3-08_Quanta_OU2_Surface_Sediment_PAH_1995_2006_Concentrations_Spatial _Analyst_Interpolation.mxd, Date: July 6, 2007, User: MPETERSH



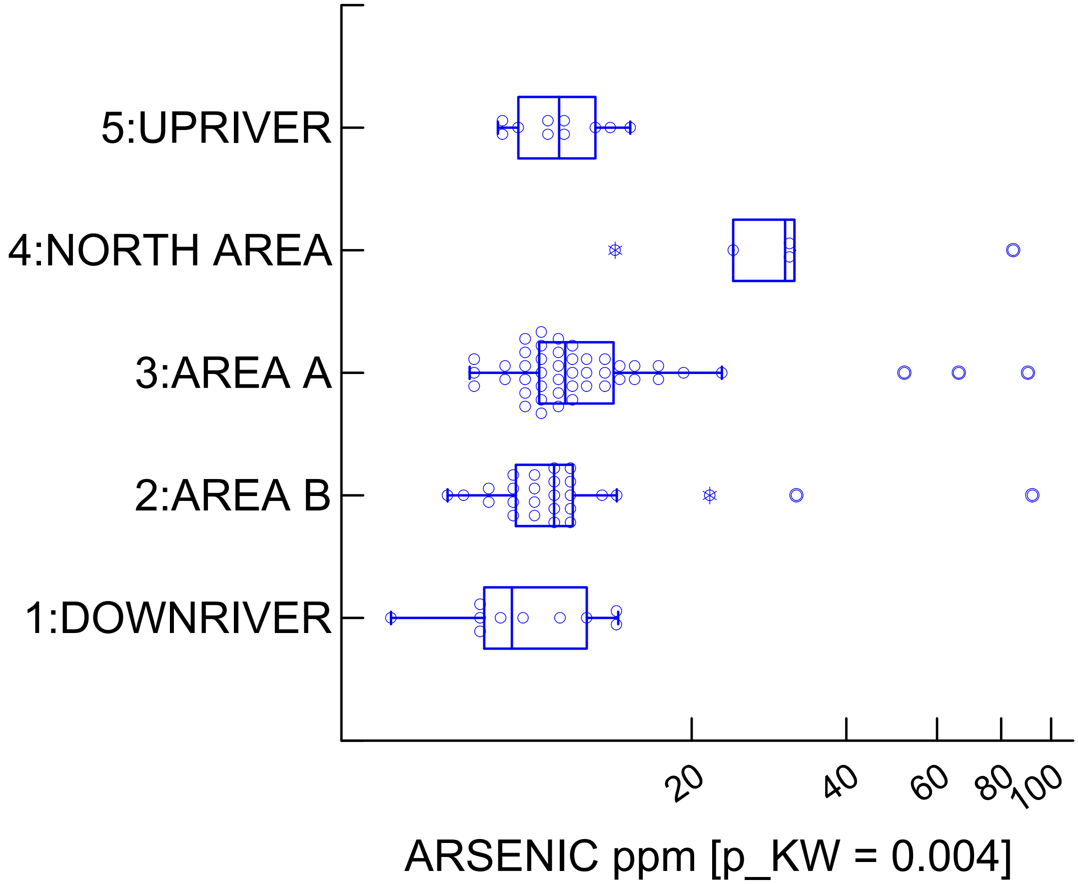


CH2MHILL

Comparison of PAH and Arsenic Surface Sediment Results to Historical Data

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-9



A box plot identifies the median (50th percentile), the lower and upper quartiles (25th and 75th percentiles), and the range (spread of the data). The box demarcates the interquartile range (middle 50% of the data). The lines, or whiskers, extend through the range of the data, excluding outliers. Outliers lie more than 1.5 times the interquartile range from the nearest edge of the box. If the probability of the Kruskal-Wallis test statistic (p_KW) is < 0.05, then the null hypothesis that the sample groups are equal cannot be supported.

CH2MHILL

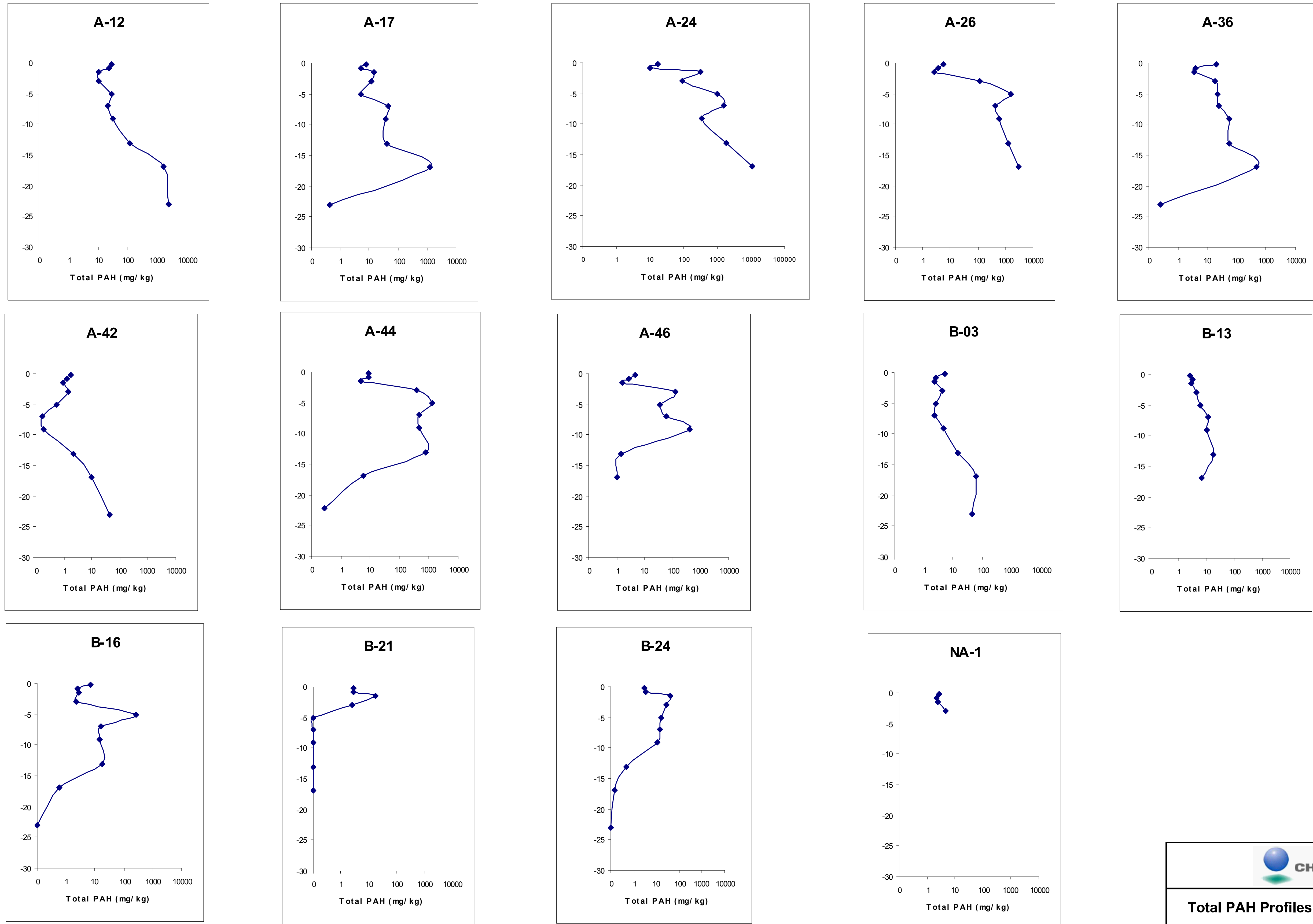
Box Plot of Arsenic Results for Surface Sediment

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-10

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\3-11_Quanta_OU2_Surface_Sediment_2006_ARS_Concentrations_Spatial _Analyst_Interpolation.mxd, Date: July 6, 2007, User: MPETERSH

File Path: E:\GIS\Honeywell\Quanta\Reports\332898_PSCR\MapDocs\PSCR_Report\3-12_Quanta_OU2_Surface_Sediment_ARS_1995_2006_Concentrations_Spatial _Analyst_Interpolation.mxd, Date: July 6, 2007, User: MPETERSH



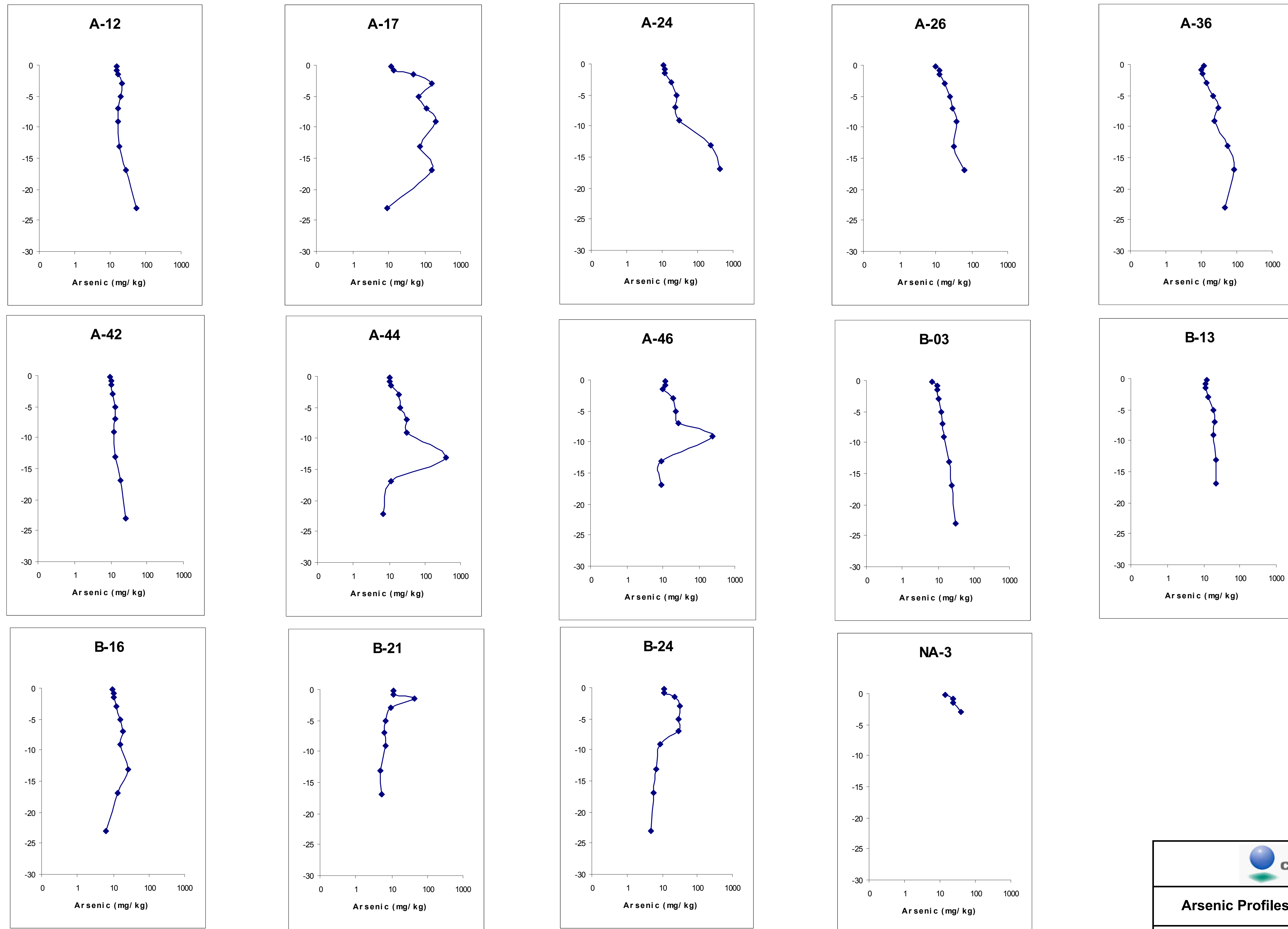
Cores were collected to a depth of 30 ft below the sediment surface. Vibracore samples were compressed during acquisition.

CH2MHILL

Total PAH Profiles in Sediment Cores

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-13



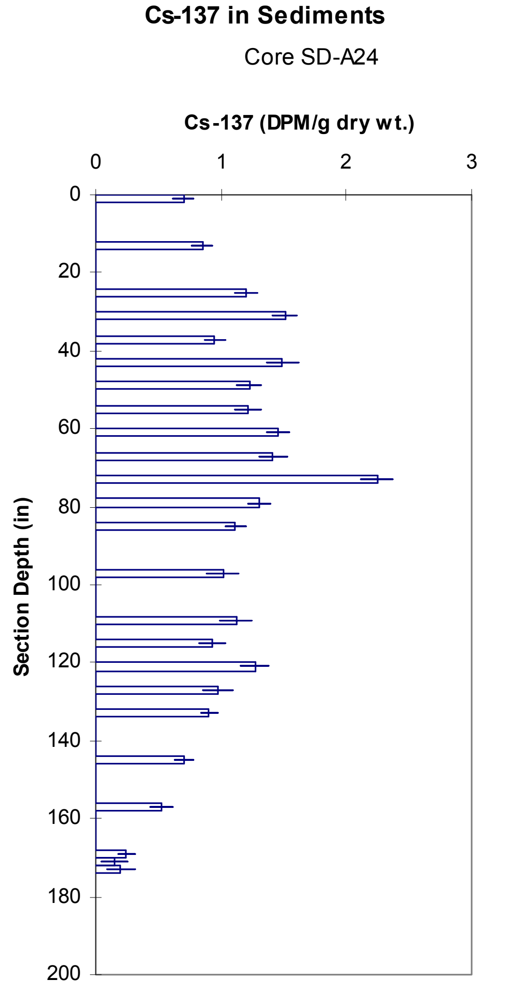
Cores were collected to a depth of 30 ft below the sediment surface. Vibracore samples were compressed during acquisition.

CH2MHILL

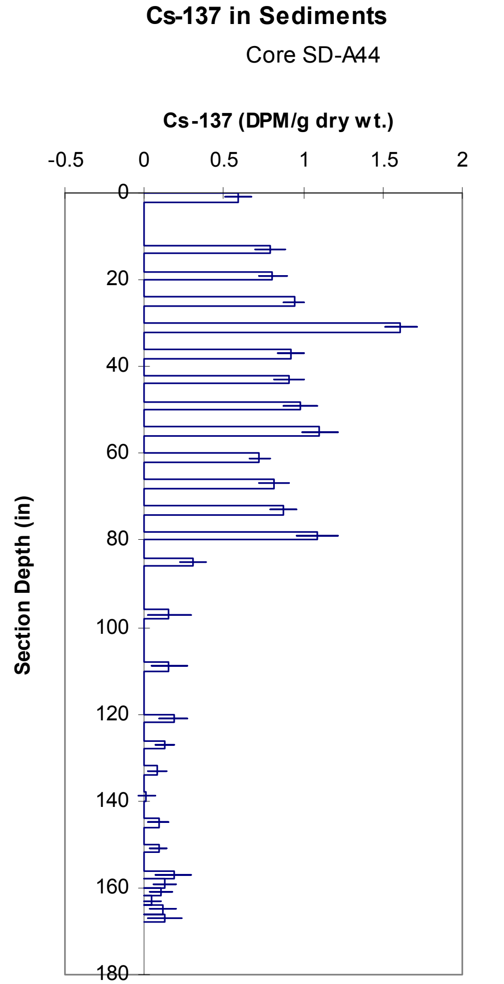
Arsenic Profiles in Sediment Cores

Quanta Resources Superfund Site
Edgewater, New Jersey

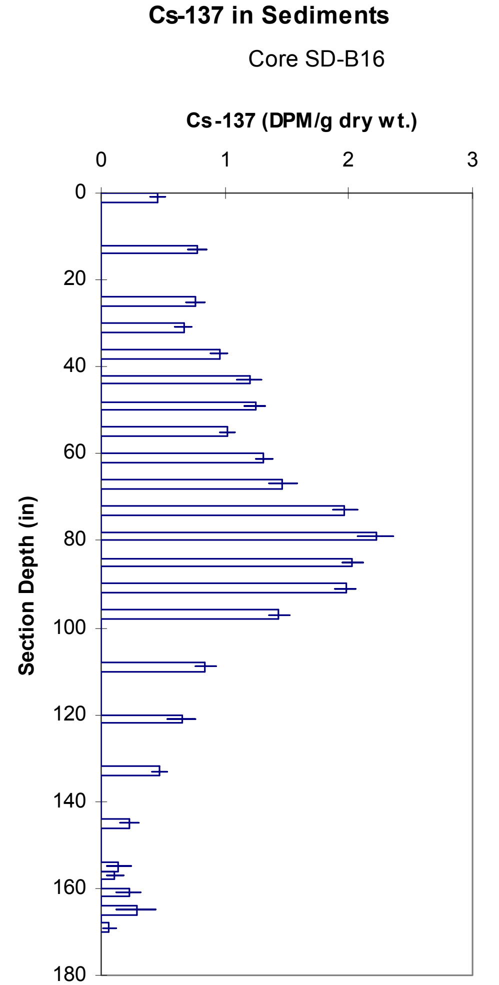
FIGURE 3-14



A-24



A-44



B-16

CH2MHILL

Cesium-137 Profiles in Sediment Cores

Quanta Resources Superfund Site
Edgewater, New Jersey

FIGURE 3-15

Appendix A
OU2 Geophysical Report

Appendix B-1
TarGOST™ Logs

Appendix B-2
TarGOST™ Users Guide

Appendix B-3
Comparison of TarGOST™ and ROST™

Appendix B-4
Comparison of TarGOST™ and Total PAHs

Appendix C
Sediment Core Logs

Appendix D
Analytical Results

Appendix E
Box Plots

Appendix F
Fingerprinting Report

DRAFT

Quanta Resources Superfund Site
Operable Unit 2 – Hudson River Sediments
Chemical Fingerprinting Study

Data Summary and Analysis Report

Prepared for:

CH2M Hill
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Suite 200
Parsippany, NJ 07054

Prepared by:

Exponent
3 Clock Tower Place, Suite 205
Maynard, MA 01754

May 31, 2007

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Appendix B. Biomarker Data Summary Tables
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Executive Summary

As part of a larger remedial investigation at the Quanta Resources site in Edgewater New Jersey, Exponent, Inc. conducted a chemical fingerprinting study on regional Hudson River sediments to evaluate potential impacts of site-related coal tar constituents to the sediments. The identification and quantification of site-related coal tar contributions to the Hudson River sediments were of interest since the areas adjacent to the site are heavily industrialized and the river has been documented as a source of hydrocarbons and other organic and inorganic components.

The design of the chemical fingerprinting program included collecting site source samples (coal tar) from Operable Unit 1 of the site, surface sediment samples from ~5.5 miles upstream of the site (US-10, north of the George Washington bridge – potentially representing reference or background), and surface sediment samples adjacent to the site (Areas A and B) and spanning a segment of the Hudson River from ~4.5 miles upstream to ~4 miles downstream of the site. In addition, four subsurface sediment samples from cores adjacent to the site (Area A - to evaluate potential impacts over the history of the site operations) and one sheen sample from the site bulkhead area (an alternate site source sample) were collected. All the samples were analyzed for a full suite of chemical fingerprinting parameters and the results were evaluated using multiple techniques to determine potential source relationships and site impacts to the river sediments.

The overall findings on potential site source contribution to the river sediments of the study area are as follows:

- No measurable impacts from site-related coal tar were apparent in the upstream US-10 samples, which were then used to represent background Hudson River hydrocarbon concentrations for the purpose of the chemical fingerprinting evaluation.
- A full suite of pyrogenic and petrogenic hydrocarbons, not related to the site, were detected in the background, upstream, across river, Area B, and the DS-8 and DS-10 downstream surface sediments.
- One of the upstream and one of the downstream surface sediments (US-2 and DS-10) show evidence of non-site related petroleum hydrocarbon impact.
- The chemical fingerprinting analysis determined that the surface sediments (A-06 and A-07 from Area A) and the sediment core samples located in Area A adjacent to the site are impacted by site-related coal tar.
- The character of the coal tar in two of the sediment cores (R-1 core and A-11 core) is somewhat different from the site coal tar, suggesting subtle temporal and compositional differences in the coal tar deep in the cores.
- The downstream surface sediments DS-2, DS-3 and DS-5 have PAH concentrations elevated above the background, although substantially lower than the Area A sediments, and are characterized by a mixture of background hydrocarbons with low levels of PAH from coal tar and/or creosote.
- Changes in parameters other than PAH (i.e., TPH, TPH-resolved, alkanes and biomarkers) for downstream sediments DS-2, DS-3 and DS-5, indicate that different

sources of coal tar and/or creosote adjacent to these stations may need to be considered to adequately characterize the hydrocarbon source relationship.

- The results of EPA's FALCON model analysis using background and site source end-members provide estimates of potential site source contributions to the river sediments that generally agree with the other fingerprinting interpretation findings.
- The FALCON model results generally underestimate the potential site PAH contributions to the river sediments when compared to simple mixing ratios of absolute PAH concentrations alone; however, absolute PAH comparisons do not account for the important relative differences in individual PAH and other hydrocarbon parameters measured.

Overall, the results of the fingerprinting analyses and interpretation show that there is a substantial hydrocarbon background in the river sediments from the study area. In stations immediately adjacent to the site (Area A surface and core samples), there are sediments with high PAH concentrations that show evidence of site-related coal tar impacts. The concentrations of hydrocarbons decrease rapidly with distance from the site, and the upstream, across river, and Area B surface sediment samples show no evidence of site-related coal tar. Two of the river sediments (US-2 and DS-10) had elevated levels of petroleum hydrocarbons from unknown source(s) that were not related to the site. The downstream sediments DS-2, DS-3 and DS-5 have PAH levels elevated above background that could be related to the site coal tar. However, the source relationships in these samples are not clear. Other potential sources of pyrogenic PAH located downstream from the site should be identified, characterized and evaluated if necessary to address this uncertainty.

1 Introduction

As part of the remedial investigation (RI) of the Quanta Resources site (the "site") Operable Unit 2 (OU2) in Edgewater, New Jersey, Exponent conducted chemical fingerprinting analysis of Hudson River sediments to discriminate site-related chemical constituents in sediments from other sources. The identification and quantification of site-related coal tar contributions to the Hudson River sediments were of particular interest since the adjacent areas are heavily industrialized and the river has been extensively documented as a carrier of hydrocarbons and other organic and inorganic components. The approach of using chemical fingerprinting to identify the sources and contribution of hydrocarbons in marine sediments, urban estuaries and other complex depositional environments has been successfully used in numerous investigations (Stout, et al., 2003; Bence, et al., 1996; Page et al, 1995).

2 Study Design

The design and implementation of the chemical fingerprinting strategy included several key components. First, three site source samples (coal tar – non aqueous phase liquid [NAPL]) were collected from Operable Unit 1 (OU1) and analyzed to characterize the coal tar source at the site. Second, three surface sediment samples from ~5.5 miles upstream of the site (north of the George Washington bridge) were collected and analyzed to characterize the upstream hydrocarbon concentrations in the Hudson River. These sediment samples were used to represent the upstream reference (background), if during the chemical fingerprinting evaluation they were determined to be free of site-related coal tar impacts. Third, surface sediment samples adjacent to the site and spanning a segment of the Hudson River from ~4.5 miles upstream to ~4 miles downstream from the site were collected and analyzed to evaluate the extent of any site-related hydrocarbon impacts. Four subsurface sediment samples (~17- 54 feet in depth) from vibracores were collected adjacent to the site to evaluate coal tar impacts to the adjacent area over the history of the site operations. One sheen sample was collected, for evaluation as an alternate source sample, with a Teflon® filter from the water surface at the site bulkhead area where sheen seeps were observed. A listing of all samples collected and analyzed for chemical fingerprinting parameters is provided in Table 1. The river sampling locations are shown in Figures 1 and 2. All source and sediment samples were analyzed for a suite of organic chemical fingerprinting analytes including parent and alkylated polycyclic aromatic hydrocarbons (PAH), chemical biomarkers (steranes and triterpanes), and saturated hydrocarbons (Tables 2 through 4).

3 Sample Collection, Preparation, and Analysis

The collection, storage and shipment of the samples were performed in accordance with the EPA-approved Remedial Investigation/Feasibility Study (RI/FS) Work Plan (CH2M Hill, 2006). The source NAPL samples and river surface sediments were collected by CH2M Hill from October 24 to December 7, 2006. Vibracore samples were collected by CH2M Hill on

December 1 to 5, 2007 in Area A. The site sheen sample was collected by Exponent on October 24, 2006. All samples designated for chemical fingerprinting analyses were shipped under chain-of-custody to Battelle's analytical laboratory in Duxbury, MA. The analytical methods for the chemical fingerprinting analyses followed the methods used in the National Oceanic and Atmospheric Administration (NOAA) National Status and Trends Program (NOAA, 1998), the Federal Register (40 CFR, Part 300) (Federal Register, 1994), and the methods described in the Guidelines for the Scientific Study of Soil Spill Effects (Robertson, 1999)

3.1 Sediment/Soil Sample Preparation for Laboratory Analysis

At the analytical laboratory the samples were prepared and analyzed following the laboratory QAPP. Approximately 30 grams of homogenized sediment sample were mixed with sodium sulfate and spiked with PAH, saturated hydrocarbon/total petroleum hydrocarbon (SHC/TPH), and biomarker (ST) surrogate compounds (compounds of known structure which are similar to the target analytes, and can be used to determine the recovery of target analytes throughout the analytical procedure). The samples were then serially extracted 3 times with organic solvent (methylene chloride) at ambient temperature on a shaker table. The resulting extract was concentrated on a hot water bath and further reduced under a stream of clean nitrogen. The extracts were then passed through alumina clean-up columns, spiked with PAH, biomarker and SHC/TPH internal standards and submitted for instrumental analysis.

Samples were extracted in batches of 20 or fewer field samples. Laboratory quality control samples accompanying each batch included a procedural blank, laboratory control sample, and control oil.

To determine dry weight, an approximately 10 – 20 gram aliquot of the well-mixed sediment from each sample was weighed into a weighing pan and dried for approximately 24 hours to calculate the percent moisture of the sediment.

3.2 NAPL/Sheen Sample Preparation

A small amount of each coal tar/sheen sample was isolated in the laboratory, weighed, and dissolved in methylene chloride. The resulting extract was filtered through sodium sulfate to remove any excess water and adjusted to a known volume, using a volumetric flask. A measured aliquot of the extract was removed, the solvent allowed to evaporate and the residue weighed on an analytical balance to obtain an extract weight. Another measured aliquot of the sample extract was processed through an alumina clean-up column, spiked with PAH, biomarker and SHC/TPH surrogates and internal standards, and submitted for instrumental analysis.

3.3 PAH and Biomarker Compound Analysis

Samples were analyzed for selected PAHs and biomarkers by gas chromatography/mass spectrometry (GC/MS) using a modified version of U. S. Environmental Protection Agency (EPA) SW-846 Method 8270 (EPA, 2001), Douglas and Uhler (1993). The EPA 8270 Method is modified to include alkylated PAH and biomarker compounds, and to lower detection limits by using selected ion monitoring (SIM). The target compound lists are included in Tables 2 and 3. The concentrations of the individual PAH and biomarker compounds were calculated versus the internal standards, which were spiked into the sample extracts prior to analysis. The target PAH and biomarker concentrations were quantified using average response factors (RF) generated from the five-point instrument calibration. Alkylated PAHs were determined using the average RF for the corresponding parent PAH compound. PAH and biomarker field and quality control sample results are provided in Appendices A and B.

3.4 SHC and TPH Analysis

Samples were analyzed for SHC and TPH by gas chromatography/flame ionization detection (GC/FID) - EPA SW-846 Method 8015 – Modified (EPA, 2001). The SHC target compound list is included in Table 4. The GC column used in this analysis provided baseline resolution of normal alkanes (n-alkanes or straight chained hydrocarbons) from n-C9 to n-C40 and n-C17/pristine and n-C18/phytane pairs (in the n-alkane nomenclature n-C9 refers to a straight chained hydrocarbon, nine carbons in length). Quantification of the target compounds was based on the internal standard compound, which is spiked into the sample prior to analysis. The target SHC concentrations were quantified using average RFs generated from a five-point instrument calibration. TPH was quantified using the average RF of n-C9 through n-C40. Isoprenoid hydrocarbons were quantified using the average RF of the preceding and following compound. SHC and TPH field and quality control sample results are provided in Appendix C.

4 Quality Assurance/Quality Control

The Quality Assurance Unit (QAU) at the Battelle analytical laboratory monitored the analytical components of the project according to existing Battelle Standard Operating Procedures (SOPs) to ensure the accuracy, integrity, and completeness of the data. Additionally, the QAU monitored project activities to ensure consistency with the applicable requirements described in the laboratory Work Plan. The QAU scope included system inspections, data audits, and reviews of documents and deliverables. Analytical project staff were responsible for ensuring that sample tracking, sample preparation, and analytical instrument operation all met the quality control criteria detailed in the applicable analytical SOPs and Work Plan. The type and frequency of analysis of QC samples and acceptance criteria are defined in the Work Plan. The data were checked to ensure that data quality objectives (DQOs) were met, that the analyses, and that the data are traceable and defensible.

4.1 Data Quality Assessment

The hydrocarbon fingerprinting data were validated by Exponent to: 1) determine if the data were generated and reported in accordance with the project quality assurance plan and specified analytical methods; 2) determine if the data meet the program data quality objectives for acceptable accuracy, precision, and sensitivity; and 3) determine and define the technical usability of the data based on the accuracy, precision, and sensitivity QA/QC indicators. During the data validation process, data packages were reviewed for completeness and the sample and quality control results were reviewed to determine if the QC requirements were met and to determine the affect of any exceeded QC requirements on the precision, accuracy, and sensitivity of the associated data. The data validation findings are included in a memo report to the CH2M project manager.

The overall quality of the analytical data was acceptable and all data were considered to be usable as reported by the laboratory with several results qualified as estimated. Final validated data are presented in Appendices A through C.

5 Chemical Fingerprinting

Chemical fingerprinting involves matching the chemical characteristics of environmental samples with those of suspected source(s). The process of analyzing data generated for chemical fingerprinting studies is multifaceted. Data inspection typically begins with evaluation of the sample chromatograms and histograms, and then proceeds to more complex analyses and data treatments. Often, hydrocarbon sources can be differentiated with chromatogram and analyte histogram inspections, review of key diagnostic parameters, and double-ratio plots. The techniques employed for this program included evaluation of chromatograms, key diagnostic parameters, double-ratio plots, regression analysis, and principal component analysis, as described in more detail below.

5.1 Qualitative Review of TPH Chromatograms, Biomarker EICPs, and PAH Histograms

The TPH chromatograms and the biomarker extracted ion current profiles (EICPs) were reviewed to evaluate and compare the chromatographic profiles for each sediment, background, and source sample. The presence and pattern of the resolved peaks and the shape, location, and size of the unresolved complex mixture (UCM) in the TPH chromatograms reveal information concerning hydrocarbon source type(s) and degree of weathering. The presence and absence of peaks and the relative peak-to-peak ratios in the biomarker EICPs reveal information concerning petroleum hydrocarbon sources.

The PAH histograms were reviewed to evaluate the composition of PAHs in the samples. The presence and absence of specific PAHs and the relative compound-to-compound ratios reveal information concerning PAH sources and degree of weathering and biodegradation. Many PAHs can be categorized as being of pyrogenic (combustion related), petrogenic (petroleum related), or biogenic (e.g., perylene which can be both anthropogenic and biogenic) in origin, thus, differences between these sources may be evident in the PAH histograms.

Based on assessments of the chromatograms, EICPs and histograms, similarities and differences between the background, site, and sources samples were noted and are detailed further below.

5.1.1 Evaluation of Upstream US-10 samples

The GC/FID chromatograms, biomarker EICPs, PAH histograms, and individual compound concentrations were evaluated for the three surface sediment samples (US-10, PAH-3, and PAH-4) collected ~5.5 miles upstream from the site to determine if this location was potentially impacted by site-related NAPL. These profiles were compared against the site-related NAPL profiles, the other surface sediment samples, and literature references for urban sediments. After extensive evaluation, it was determined that no measurable impacts from site-related NAPL were apparent in these samples. As a result, the US-10 samples were used to represent background hydrocarbon concentrations in the Hudson River for the purpose of this chemical fingerprinting evaluation. The term background, as used in the following sections of this report, refers to these three surface sediment samples.

5.1.2 TPH Chromatograms

The GC/FID chromatograms for the site NAPL samples consist of many resolved peaks in the 10 to 50 minute range with no UCM. None of the resolved peaks in the NAPL samples were identified as normal alkanes and most were determined to be pyrogenic PAHs. Figure 3 displays the three NAPL TPH Chromatograms.

The GC/FID chromatograms for the three background samples collected ~5.5 miles upstream from the site reveal a complex suite of mid- and heavy-range hydrocarbons. The more abundant resolved peaks are present in the 30 to 55 minute range with several normal alkanes reported in the n-C10 through n-C31 carbon chain length range. The background samples are also characterized by a large UCM in the 25 to 60 minute range with a plateau from 45 to 55 minutes. Figure 4 displays the three background sediment sample TPH chromatograms, which overall, are typical of a mixture of terrigenous and anthropogenic hydrocarbons.

The resolved peak distributions and UCMs in the chromatograms for all sediment samples collected upstream (with the exception of US-2) and collected at stations NA-3, B-13, B-16, B-19, and DS-8 are very similar to the background samples. The observed similarities between these sediment samples and the three background samples indicate that these are generally representative of the background hydrocarbons present in Hudson River sediments. Figure 5 shows the TPH chromatograms for US-9, B-19, and DS-8, which are representative of most of the upstream sediment samples.

The GC/FID chromatograms for the sediment samples collected at stations US-2 and DS10 show large UCMs with resolved peaks in the 20 to 60 minute range and maximizing at approximately 38 and 45 minutes, respectively. The TPH chromatograms for these samples resemble of mixture of the river background hydrocarbons and heavy petroleum impacts. Figure 6 displays the TPH chromatograms for US-2 and DS-10.

The GC/FID chromatograms for the core samples collected at stations A-20 and A-14 resemble a mixture of fresh coal tar and some background sediment, while the chromatograms for the core samples collected at stations A-11 and R-1 resemble fresh coal tar. The TPH chromatograms for all four sediment core samples are shown in Figure 7.

The chromatograms for sediment samples collected at stations A-16, A-23, A-25, A-44, DS-2, DS-3, and DS-5 generally resemble the river background, with a large UCM in the 25 – 60 minute range. However, the distribution of some resolved peaks varies from the pattern observed in the background samples, and indicates the enhancement of pyrogenic PAH input, likely from a weathered coal tar or creosote source. Figure 8 shows the TPH chromatograms for A-16, A-25, and DS-3.

The resolved peaks in sediment sample A-06 and A-07 resemble weathered coal tar mixed with small proportion of background hydrocarbons. There is a minor UCM evident in the 30 to 55 minute range, indicating the background contribution (Figure 9). The chromatogram for the sheen sample collected at the site bulkhead (Bulkhead-02) also shows a distinct weathered coal tar signature (Figure 9).

5.1.3 Biomarker EICPs

Triterpanes are generally abundant in petroleum and are used as source markers or indicators of petroleum generation in source formations during oil exploration. Due to their source-specific nature, triterpanes can also be used in the chemical fingerprinting of crude oils and many refined petroleum products. They are also present to varying degrees in petroleum source rock and coals, but are not generally abundant in coal tar unless the tar contains coal particles or petroleum. The triterpane EICPs for the site NAPL samples contain several trace level resolved peaks (Figure 10), while the EICPs for the background sediment samples contain a full suite of triterpanes (in the 44-63 minute retention time range) typical of petroleum hydrocarbon sources (Figure 11). Because of the trace level biomarkers in the source samples, the biomarker data are not useful in determining where site-related hydrocarbons exist. However, these parameters are useful in showing which samples have hydrocarbon signatures consistent with background and which samples may be impacted by other non-site related petroleum sources.

All of the surface sediment samples collected upstream, downstream, and adjacent to the site (with the exception of US-2 and DS-10) have triterpane distributions and Total ST concentrations (Table 6) that are generally similar to the background sediments. Triterpane EICPs for US-9, B-19 and DS-8 are shown in Figure 12. Several subtle differences were noted in the triterpane EICPs for sediment samples collected at stations US-2 and DS-10 as compared to background; the relative peak ratios are different in the retention time ranges of 48 to 49 minutes (tetracyclics), 56 to 57 minutes (bishomohopanes), and 60 to 62 minutes (C35-homohopane range; Figure 13). In addition, the absolute concentration of Total ST is substantially higher than background in these two samples. These differences indicate an unidentified and non-site related petroleum source contribution to the sediments at these two stations.

Triterpane EICPs for the sediment cores samples from stations A-20, and R-1 have triterpane distributions which are generally similar to the patterns observed in background sediments (Figure 14), indicating a background component in these samples. The triterpane EICPs for the sediment core samples from stations A-14 and A-11 contains a few very trace level resolved peaks indicating that these samples have little background sediment contribution to the overall hydrocarbon assemblage.

5.1.4 PAH Histograms

Based on comparisons to known PAH distributions for coal tars, the PAH histograms for the site NAPL samples resemble a fresh coal tar sample with higher concentrations of the parent PAHs and lower and lower concentrations of the alkylated PAHs. The samples show a characteristic fresh coal tar signature with, the parent PAHs (naphthalene, phenanthrene, fluoranthene, and pyrene) in the greatest abundance and with the fluoranthene concentration 10-20 percent greater than the pyrene concentration. The weight percent of PAHs in the site NAPL samples is approximately 35%. Figure 15 displays the three NAPL PAH histograms.

The histograms for the three background samples are composed of a full suite of both parent and alkyl PAHs indicative of a mixture of pyrogenic, petrogenic and biogenic (i.e., perylene) hydrocarbon sources. This assemblage of PAHs in these samples is typical of mixed anthropogenic sources (e.g., urban run-off, petroleum, combustion) and is shown in Figure 16.

The PAH distributions in the histograms for all sediment samples collected upstream of the site (with the exception of US-2 and US-8) and collected at stations NA-3, B-13, B-16, B-19, and DS-8 are very similar to the background samples. A slight enhancement in benzo(a)pyrene and variation in perylene abundance is noted in several of these samples. As noted previously, perylene can be a naturally occurring PAH, which may contribute to the variability observed in these sediments. Figure 17 displays the PAH histograms for US-9, B-19, and DS-8.

The histogram for the sediment sample collected at station US-8 shows a background PAH pattern with a subtle enrichment of the pyrogenic PAHs phenanthrene, fluoranthene, and pyrene (Figure 18). The PAH histograms for the sediment samples collected at stations US-2 and DS-10 show alkylated PAHs and dibenzothiophenes in greater relative concentrations than the associated parents corroborating the identification of petroleum noted earlier in these two samples (Figure 18).

The PAH histograms for the core samples collected at stations A-20 and A-14 resemble a mixture of slightly-weathered coal tar and background hydrocarbons, while the histograms for the core samples collected at stations A-11 and R-1 generally resemble fresh coal tar (Figure 19).

The PAH histograms for sediment samples collected at stations A-16, A-23, A-25, A-44, DS-2, DS-3, and DS-5 resemble the background samples with enhancement of pyrogenic PAHs phenanthrene, fluoranthene, and pyrene indicating the presence of varying degrees of a weathered pyrogenic component (i.e., coal tar or creosote). Histograms for A-16, A-25 and DS-3 are shown in Figure 20. The enhanced pyrogenic contribution to Area A surface sediments is likely site related based the proximity of these stations to the site. The source of the enhanced pyrogenic PAHs to downstream locations is less certain and may be site related or may be due to other sources adjacent to these sites.

The PAH histograms for sediment samples collected at stations A-06 and A-07 resemble background sediment with an enrichment from a weathered coal tar source. The histogram for the sheen samples collected at Bulkhead-02 resembles a weathered coal tar (Figure 21).

5.2 Key Diagnostic Parameters

Descriptions of key diagnostic parameters, which are useful in describing the overall organics dataset, are included in Table 5. Many of these parameters and others have been used in hydrocarbon fingerprinting investigations, and studies of coal tar in the environment (Brenner et al., 2002; Stout et al., 2002; and EPRI, 2003). These parameters were calculated for the sample data set and evaluated to aid in discerning the observed hydrocarbon sources in the sediments.

Three general parameters that provide a good overall representation of the hydrocarbon distribution upstream and downstream from the site are Total PAH, Total ST, and TPH. Sample concentrations for Total PAH, Total ST, and total and resolved TPH are provided in Table 6. Figures 22 and 23 include line graphs for these parameters for the surface sediment samples and the sediment cores. The samples are sorted within the graph according to relative distance from the site, and the 95% confidence intervals for the mean of the background stations plotted on the line graphs for comparison. Large increases in concentration are noted for both the TPH and Total PAH parameters at stations A-06 and A-07 and all the sediment core samples indicating a probable link to site-related coal tar impacts at these stations.

Smaller increases (2 to 5 times background) were noted for the PAH parameter at stations A-16, A-23, A-25, DS-2, DS-3, and DS-5 without a corresponding increase in TPH or Total ST, indicating a potential contribution of site-related hydrocarbons at these stations. The increases in TPH at stations US-2 and DS-10 are not associated with corresponding increases in Total PAH, but are associated with increases in Total ST, indicating that the increased TPH concentrations at these stations are likely related to petroleum input, as previously noted.

Another parameter that is useful in depicting the hydrocarbon distribution in the river sediments is the ratio of TPH-resolved (the sum of the discrete peaks in the chromatogram) to total TPH (the total area of the chromatogram). For the site NAPL samples approximately 75% of the TPH concentration is attributed to the resolved peaks, while resolved TPH peaks only contribute 5% to the total TPH concentration in the background samples. A line graph for this parameter is included in Figure 23 for the surface and core sediment samples, and the NAPL samples. The majority of the surface sediment samples have ratios near 0.10 or lower, and are in the same range as the background sediments. Ratios substantially greater than 0.10 are noted for the surface sediments collected at stations A-06, A-07, A-16, A-23, A-25, for all of the sediment cores, and for the site NAPL and sheen samples, clearly indicating a coal tar source in these samples. The ratio for core sample A-20 was only slightly elevated above 0.10, indicting a greater contribution of background sediment in this sample, as was observed in the GC/FID chromatogram (Figure 7).

5.3 Double-Ratio Plots

Several double-ratio plots were used to evaluate the background and site-related hydrocarbon sources in the sediment samples. Due to the complex mixture of hydrocarbons encountered in the sediment samples, many of the common double-ratio plots used in hydrocarbon fingerprinting (Brown and Boehm, 1993; Stout, et al., 2003 [e.g., the ratios of alkyl-dibenzothiophenes to alkyl-phenanthrenes, benz(a)anthracene to chrysenes, etc.]) were not effective in accurately distinguishing the source samples (i.e., bulkhead sheen and NAPLs) from the background sediments.

The double ratio plot of the F/P *vs*. F/P/(C1 to C3 F/P) ratios was useful in differentiating the background and upstream sediments from the site NAPL samples and coal tar impacted sediment cores. The F/P ratio can be a characteristic indicator of coal tar/creosote PAH versus background PAH (Boehm, 2006, Costa and Sauer, 2005, Budzinski, et al., 1997), and is greater than 1.1 in all the NAPL source samples and approximately 0.9 in the background samples. The F/P/(C1 to C3 F/P) ratio changes with additions of fresh to moderately weathered coal tar/creosote to a background PAH profile. The resulting double ratio plot in Figure 24 shows that the core samples are closely associated with coal tar/creosote PAHs and stations A-06, A-07, A-16, A-23, and A-25 are likely impacted by coal tar. Some samples with a possible enrichment of pyrogenic PAH include A-44, DS-5, US-8, and NA-3, with the level of apparent impact decreasing with increasing distance between the sample and NAPL data points on the double ratio plot (Figure 24).

5.4 Chemical Mixing Model

The results for the three background surface sediment samples collected upstream from the site (US-10, PAH-3, PAH-4) were averaged to estimate background sediment concentrations and the results of the three NAPL samples collected from OU1 were averaged to estimate a source concentration. Using a two end-member mixing equation the site NAPL was mathematically added to the average background sediment to predict the concentrations of individual compounds in Hudson River sediment samples impacted with various concentrations of site NAPL. A value of one-half the reporting limit was entered for non-detect results prior to performing the mixing model calculations. The following concentrations of source NAPL were mathematically added to the background sediment to calculate the composition of mixed sediment samples: 5 micrograms per gram (µg/g), 10 µg/g, 25 µg/g, 50 µg/g, 100 µg/g, 200 µg/g, 500 µg/g, 5,000 µg/g, 25,000 µg/g, and 50,000 µg/g. For example, the concentrations for each compound detected in 10 micrograms of source NAPL were added to the concentrations for each compound detected in one gram of average background sediment to generate the predicted compound concentrations for one gram of reference sediment containing 10 ug of source NAPL.

The results of the chemical mixing model were compared with summed concentrations of TPH, Total PAH, and Total ST in the surface and core sediment samples, and were used as input into the FALCON analysis (Plumb, 2004) described below. Table 6 summarizes the TPH, Total PAH, and Total ST concentrations for the field samples. The overall findings of the mixing model are summarized later in the report. However, one factor became apparent in evaluating mixing calculations; the variance in the TPAH measurements for the three background samples was unusually low (8134 µg/g ± 0.65%), and significantly smaller than the variance measured for the other bulk parameters in the same three samples (i.e., ± 10 % for Total ST, and ± 12 % for TPH). The small degree of variance around the background PAH values caused most of the surface sediment PAH concentrations to be significantly greater than background, even though, there are no apparent site-related coal tar impacts at most of the stations. As a result, subsequent statistical treatments of the data for source allocation focused on approaches capable of using all classes of parameters measured, and not just absolute PAH concentrations (i.e., principal component analysis and FALCON analysis).

5.5 Statistical Analyses

Statistical analyses were evaluated according to EPA Data Quality Assessment: Statistical Methods for Practitioners (EPA QA/G-9S) and Fingerprint Analysis of Contaminant Data (Plumb, 2004) and were performed using the statistical program SPSS® 8.0. Principal component analyses was performed using Sirius® 7.0.

5.5.1 Sample Transformations

Prior to transformation, a value of one-half the reporting limit was entered for all non-detect results. Sample concentration data were then log-normal transformed prior to statistical analyses to normalize distribution.

The compounds selected for inclusion into the PCA and FALCON analyses included:

- All parent and alkylated PAH compounds with the exception of naphthalene, methylnaphthalenes, and biphenyl. These three PAHs were excluded because they were generally depleted in the sediment samples due to water washing and weathering.
- Alkanes n-heptadecane, n-octadecane, n-heneicosane, n-pentacosane, n-heptacosane, n-octacosane, n-nonacosane, and n-hentriacontane. This set of alkane compounds was selected because they were detected in more than 50% of the samples. Dodecane was detected in more than 50% of the sediment samples, but was excluded because it was only detected in one of the three background sediments and none of the source samples.
- TPH total and TPH-resolved.
- Biomarkers 18a(H)-22,29,30-trisnorneohopane –Ts, 17a(H)-22,29,30-trisnorhopane –

Tm, 30-Norhopane, 18a(H)-30-norneohopane -C29Ts, hopane, moretane, 14a(H),17a(H)-20S-cholestane. This set of biomarkers was selected because they were detected in at least two of the three source NAPL samples.

5.5.2 Principal Component Analysis

Principal component analysis (PCA) is one type of ordination or factor analysis by which multivariate data sets can be interpreted and evaluated. In this study, PCA was used as a data exploration technique to compare source materials and background samples to environmental (river) samples. The PCA analysis was used as a fingerprinting tool to reduce the dimensionality of the data to a few important principal-components that best describe the variation in the data.

The primary objective of the PCA was to aid in the classification of the sediment samples based on their chemical similarities or differences, without any pre-classification as to their nature or source(s). The results of the PCA for the PAH, SHC and ST data sets are presented in a 2-dimensional factor score plot (Figure 25). This plot of the first and second principal components accounts for 94.8 % of the variance in the data set. The spatial relationship of the samples in the plot is representative of the chemical similarity or difference of the samples and sources. In the factor plot, the site NAPL samples cluster together indicating a similar chemical composition (i.e., coal tar) while the river sediments form a distinct cluster of samples due to their common chemical composition of a suite of background hydrocarbons. It should be noted that the two samples enriched in petroleum hydrocarbons (US-2 and DS-10) show some separation from the main cluster of background hydrocarbon samples. The core samples and surface sediments A-06 and A07 all plot in the in the upper right quadrant of the graph suggesting a similar hydrocarbon source, strongly influenced by coal tar, and clearly different from the other river sediments. Surface sediment A-16 is slightly offset to the right of the background group and may be impacted by trace levels of coal tar. The clustering of the samples in the PCA factor plot is consistent with the results of the visual evaluations of the SHC and triterpane chromatograms and PAH distributions performed earlier.

The basis for the clustering of the samples in the factor plot is explained by associated scores plot of the PCA (Figure 26). For example, the scores plot shows a general mixing line between the upper left and lower right, corresponding to a mixing line between the two primary groupings or end members (surface sediments and coal tar source samples). The scores show that surface sediments are enriched in biomarkers, alkanes, TPH and alkyl PAH. In contrast, the coal tar NAPLs are enriched in the parent PAH, whereas the core samples, have a similar enrichment of parent PAHs indicating a coal tar signature, but also contain a mixture of background sediment components (biomarkers, alkanes and alkyl PAH). Core samples R-1 42.5-43.5 and A-11 17.5-18.5 have a similar parent PAH enrichment, but also show have a greater abundance of low molecular weight PAH, indicating fresh, un-weathered the coal tar signature in these samples.

5.5.3 FALCON Analysis

FALCON Analysis (Plumb, 2004) was used during our chemical fingerprinting analysis to estimate the potential concentration of site NAPL in the sediment samples collected from the Hudson River. The FALCON analysis is a multi-variate chemical fingerprinting procedure developed through EPA's Technical Support Center to aid in identifying the contaminant sources and estimating the degree of mixing that has occurred between multiple contaminant sources. For our analysis we investigated the degree of mixing between background hydrocarbons in the Hudson River sediments (US-10 samples) and the coal tar NAPLs collected from the site.

The mixing model combined, at varying relative concentrations, the hydrocarbon fingerprint for the background samples and the site-related NAPL fingerprint. There is sufficient difference in the two sources so that the chemical fingerprint of the background sediment shifts with increasing additions of NAPL source. Predicted sediment sample fingerprints generated by the mixing model were then compared to all of the Hudson River field sample fingerprints using regression analysis. The degree of NAPL impact was estimated by finding the modeled sample fingerprint that "best fit" the field sediment sample fingerprint. For example, for samples with no site-related NAPL impacts, the fingerprint of the field sediment sample was most similar to the fingerprint of the average background sample fingerprint. Table 7 summarizes the regression analysis results for each comparison and identifies the modeled sample composition that provided the best match (highest r-squared) for each field sediment sample. Each comparison produced a maximum r-square value of greater than 0.850 with the following exceptions:

- US-2 – The best match for this sample was background. However, the r-squared for this sample was 0.733, which was much lower than the other upstream sediments. There is evidence that this sample is impacted with petroleum and is different from both the background samples and the NAPL and source – thus a lower r-squared value would be expected.

- The maximum r-squares for sediment samples A-06, A-07, A-16, A-23, and A-25 ranged from 0.749 to 0.843. The cross plots for these samples with their best matches indicated that the PAH concentration in samples A-06 and A-07 were less than the best match mixes, indicating that coal tar in these samples may be highly weathered. The cross plots for samples A-16, A-23, and A-25 showed a greater spread in the data point along the regression line that is likely related to random variability.

- The lower r-square (0.836) in sediment core sample collected at station A-14 core is due to one outlying point; n-octadecane was detected in the field samples at a concentration approximately twice the predicted concentration in the best match mixture.

It should be stressed that the FALCON model incorporates analytical parameters in addition to individual PAHs, and represents a regression of multiple data sets. As an independent check on the accuracy of the FALCON output, an increase in PAH concentration above background levels was determined two ways for each sample. Table 7 summarizes the amount of additional PAH above background as predicted by FALCON, and as measured in the field sample by subtracting the mean background concentration (i.e., mean of US-10, PAH-3, and PAH-4) from the total PAH concentration. The predicted values from FALCON are based on the relative concentrations of individual PAHs, alkane, biomarkers, TPH, and TPH-resolved (i.e., the chemical fingerprint), whereas the measured concentrations in field samples are based only on the absolute differences in total PAH concentrations. Based on a comparison of these values, it appears that the FALCON analysis underestimates the potential site-related PAH impacts in most of the sediments. However, using only the absolute difference between background and field sample PAH concentrations to estimate potential site-related impacts is inadequate at this site because it does not incorporate the relative concentrations of individual PAHs, TPH, TPH-resolved, alkanes, and biomarkers (all important contributors to the observed complex mixture of pyrogenic, petrogenic and terrigenous hydrocarbons in the river sediments). Nor does the comparison of field sample to background PAH concentration take into account the unusually small degree of variation observed in the total PAH concentrations in the background samples. The FALCON model, supported by the cumulative chemical fingerprinting findings (Table 8), serves as a reasonable estimate of the potential impact of site-related hydrocarbons to the river sediments. Additional factors including other potential sources of hydrocarbons (e.g., creosote, manufactured gas, other sites) downstream of the site may need to be considered to more accurately establish the degree of site-related impacts.

6 Conclusions

When evaluating the data set for this study, multiple lines of interpretation must be used to obtain a clear understanding of the complex source relationships in the river sediments. Using a weight of the evidence approach, with multiple analytical tools, the cumulative findings from both the qualitative and quantitative chemical fingerprinting analysis are summarized in Table 8. The consensus conclusions on potential site source contribution to the river sediments for this study are as follows:

- A full suite of pyrogenic and petrogenic hydrocarbons were detected in the background, upstream, across river, Area B, and the DS-8 and DS-10 downstream surface sediments, and are not related to site sources.
- One of the upstream and one of the downstream surface sediments (US-2 and DS-10) show evidence of non-site related petroleum hydrocarbon impact.
- The chemical fingerprinting analysis determined that the surface sediments (A-06 and A-07) and the sediment core samples located in Area A adjacent to the site are impacted by site-related coal tar NAPL.
- The character of the coal tar in two of the sediment cores (R-1 core and A-11 core) is somewhat different from the site coal tar, suggesting subtle temporal and compositional differences change in the coal tar deep in the cores.
- The downstream surface sediments DS-2, DS-3 and DS-5 have PAH concentrations elevated above the background, although substantially lower than the Area A sediments, and are characterized by a mixture of background hydrocarbons with low

levels of PAH from coal tar and/or creosote.

- Changes in parameters other than PAH (i.e., TPH, TPH-resolved, alkanes and biomarkers) for downstream sediments DS-2, DS-3 and DS-5, indicate that different sources of coal tar and/or creosote adjacent to these stations may need to be considered to adequately characterize the hydrocarbon source relationship.
- The results of the FALCON analysis using background and site source end-members provide estimates of potential site source contributions to the river sediments that generally agree with the other fingerprinting interpretation findings.
- The FALCON results generally underestimate the potential site PAH contributions to the river sediments versus simple mixing ratio comparisons of absolute PAH concentrations alone; however, absolute TPAH comparisons do not account for the important relative differences in individual PAH, TPH and ST parameters.

Overall, the results of the fingerprinting analyses and interpretation show that there is a substantial hydrocarbon background in the river sediments from the study area. In stations immediately adjacent to the site (Area A surface and core samples), there are sediments with high PAH concentrations that show evidence of site-related coal tar impacts. The concentrations of hydrocarbons decrease rapidly with distance from the site, and the upstream, across river, and Area B surface sediment samples show no evidence of site-related coal tar. Two of the river sediments (US-2 and DS-10) had elevated levels of petroleum hydrocarbons from unknown source(s) that were not related to the site. The downstream sediments DS-2, DS-3 and DS-5 have PAH levels elevated above background that could be related to the site coal tar. However, the source relationships in these samples are not clear. Other potential sources of pyrogenic PAH located downstream from the site should be identified, characterized and evaluated if necessary to address this uncertainty.

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Table 1. Chemical Fingerprint Sample Summary

Client Sample ID	Sample Location Code	Sample Depth (feet below sediment surface)	River Location (relative to site)	Sample Area	Collection Date
SD-PAH-3-0-0.5-103006	US-10 (PAH-3)	0-0.5	-10.0	Upstream	10/30/06
SD-PAH-4-0-0.5-103006	US-10 (PAH-4)	0-0.5	-10.0	Upstream	10/30/06
SD-US-10-0-0.5-103006	US-10	0-0.5	-10.0	Upstream	10/30/06
SD-US-9-0-0.5-103006	US-9	0-0.5	-9.0	Upstream	10/30/06
SD-US-8-0-0.5-103006	US-8	0-0.5	-8.0	Upstream	10/30/06
SD-US-7-0-0.5-103006	US-7	0-0.5	-7.0	Upstream	10/30/06
SD-PAH-2-0-0.5-103006	PAH-2	0-0.5	-3.5	Upstream	10/30/06
SD-US-3-0-0.5-103006	US-3	0-0.5	-3.0	Upstream	10/30/06
SD-US-2-0-0.5-103006	US-2	0-0.5	-2.0	Upstream	10/30/06
SD-US-1-0-0.5-103006	US-1	0-0.5	-1.0	Upstream	10/30/06
SD-NA-3-0.0-0.5	NA-3	0-0.5	-0.5	Upstream	12/07/06
SD-A-06-0-0.5-102406	A-06	0-0.5	0.0	OU2 Area A	10/24/06
SD-A-07-0-0.5-102406	A-07	0-0.5	0.0	OU2 Area A	10/24/06
SD-A-16-0-0.5-103006	A-16	0-0.5	0.0	OU2 Area A	10/30/06
SD-A-23-0-0.5-102406	A-23	0-0.5	0.0	OU2 Area A	10/24/06
SD-A-25-0-0.5-102406	A-25	0-0.5	0.0	OU2 Area A	10/24/06
SD-A44-0-0.5-111306	A-44	0-0.5	0.0	OU2 Area A	11/13/06
SD-B-13-0.0-0.5	B-13	0-0.5	0.0	OU2 Area B	12/07/06
DUP-120706-SD2	B-13 Dup	0-0.5	0.0	OU2 Area B	12/07/06
SD-B16-0-0.5-111306	B-16	0-0.5	0.0	OU2 Area B	11/13/06
SD-B-19-0-0.5-102406	B-19	0-0.5	0.0	OU2 Area B	10/24/06

Table 1 (continued). Chemical Fingerprint Sample Summary

Client Sample ID	Sample Location Code	Sample Depth (feet below sediment surface)	River Location (relative to site)	Sample Area	Collection Date
SD-DS-2-0-0.5-103106	DS-2	0-0.5	2.0	Downstream	10/31/06
DUP-103106	DS-2 Dup	0-0.5	2.0	Downstream	10/31/06
SD-DS-3-0-0.5-103106	DS-3	0-0.5	3.0	Downstream	10/31/06
SD-DS-5-0-0.5-103106	DS-5	0-0.5	5.0	Downstream	10/31/06
SD-US-8-0-0.5-103106	DS-8	0-0.5	8.0	Downstream	10/31/06
SD-DS-10-0-0.5-103106	DS-10	0-0.5	10.0	Downstream	10/31/06
SD-A-11-17.5-18.5	A-11 Core	17.5-18.5	0.0	Area A – Core	12/01/06
SD-A-14-57-58	A-14 Core	57-58	0.0	Area A – Core	12/04/06
SD-A-20-44-45	A-20 Core	44-45	0.0	Area A – Core	12/04/06
SD-R-1-42.5-43.5	R-1 Core	42.5-43.5	0.0	Offsite – Core	12/05/06
SD-PAH-1-0-0.5-103106	PAH-1	0-0.5	-5.0	Across River	10/31/06
Bulkhead-02-fp	Sheen	0-0.5	0.0	Site Sheen	10/24/06
MW-102AD-102606	MW-102AD	0-0.5	0.0	Site NAPL	10/26/06
MW-105D-101606	MW-105D	0-0.5	0.0	Site NAPL	10/16/06
MW-116BD-101606	MW-116BD	0-0.5	0.0	Site NAPL	10/16/06
Bulkhead Blank	Bulkhead Blank	--	NA	Blank	10/24/06
EB-120606-SD	Equipment Blank	--	NA	Blank	12/06/06

Table 2. Polynuclear Aromatic Hydrocarbon and Alkyl Polynuclear Aromatic Hydrocarbon Target List

Compound	Reporting Code	Compound	Reporting Code
Naphthalene	**C0N**	Benzo[a]anthracene	**BAA**
C1-Naphthalenes	**C1N**		
C2-Naphthalenes	**C2N**	Chrysene	**C0C**
C3-Naphthalenes	**C3N**	C1-Chrysenes	**C1C**
C4-Naphthalenes	**C4N**	C2-Chrysenes	**C2C**
		C3-Chrysenes	**C3C**
Acenaphthylene	**ACEY**	C4-Chrysenes	**C4C**
Acenaphthene	**ACE**		
Biphenyl	**BIP**		
Dibenzofuran	**DBF**	Benzo[b]fluoranthene	**BBF**
Fluorene	**C0F**	Benzo[k]fluoranthene	**BKF**
C1-Fluorenes	**C1F**	Benzo[e]pyrene	**BEP**
C2-Fluorenes	**C2F**	Benzo[a]pyrene	**BAP**
C3-Fluorenes	**C3F**	Perylene	**PER**
		Indeno[1,2,3-c,d]pyrene	**IND**
Anthracene	**C0A**	Dibenzo[a,h]anthracene	**DAH**
Phenanthrene	**C0P**	Benzo[g,h,i]perylene	**BGP**
C1-Phenanthrenes/Anthracenes	**C1P/A**		
C2-Phenanthrenes/Anthracenes	**C2P/A**		
C3-Phenanthrenes/Anthracenes	**C3P/A**		
C4-Phenanthrenes/Anthracenes	**C4P/A**		
Dibenzothiophene	**C0D**		
C1-Dibenzothiophenes	**C1D**	Surrogate Compounds	
C2-Dibenzothiophenes	**C2D**	Naphthalene-d8	**D8N**
C3-Dibenzothiophenes	**C3D**	Acenaphthene-d10	**D10ACE**
		Phenanthrene-d10	**D10PH**
Fluoranthene	**FLANT**	Benzo(a)pyrene-d12	**D12BAP**
Pyrene	**PYR**		
C1-Fluoranthenes/Pyrenes	**C1F/P**	Internal Standard	
C2-Fluoranthenes/Pyrenes	**C2F/P**	Fluorene-d10	**D10F**
C3-Fluoranthenes/Pyrenes	**C3F/P**	Chrysene-d12	**D12C**

Internal Standard/Surrogate Reference indicates internal standard used for quantitation and surrogate compounds used to correct analytical results.

2-ring PAHs include: napthalenes, acenaphthylene, acenaphthene, biphenyl, and fluorenes
3-ring PAHs include: anthracenes, phenanthrenes, and dibenzothiophenes
4-ring PAHs include: fluoranthenes, pyrenes, benzo(a)anthracene, chrysenes, benzo(b)fluoranthene, and benzo(k)fluoranthene
5-ring PAHs include: benzo(e)pyrene, benzo(a)pyrene, perylene, indeno(1,2,3-cd)pyrene, and dibenz(a,h)anthracene
Benzo(g,h,i)perylene is a 6-ring PAH

Table 3. Sterane and Triterpane Target List

Compound	Reporting Code	Compound	Reporting Code
C23 Diterpane	T4	Surrogate Compounds	
13β,17α-diacholestane(20S)	S4	5β(H)-cholane	5B
13β,17α-diacholestane(20R)	S5		
C29 Tricyclictriterpane	T9	Internal Standards	
C29 Tricyclictriterpane	T10	Chrysene-d12	D12C
## 5α,14α,17α-cholestane(20R)	S17		
18α(H)-22,29,30-trisnorhopane(TS)	T11		
17α(H)-22,29,30-trisnorhopane(TM)	T12		
5α,14α,17α,24-methylcholestane(20R)	S24		
5α,14α,17α,24-ethylcholestane(20S)	S25		
5α,14α,17α,24-ethylcholestane(20R)	S28		
17α(H),21β(H)-30-norhopane	T15		
18α(H)-oleanane	T18		
17α(H),21β(H)-hopane	T19		
22S-17α(H),21β(H)-30-homohopane	T21		
22R-17α(H),21β(H)-30-homohopane	T22		
## 17β(H),21β(H)-hopane	T23		

Internal Standard/Surrogate Reference indicates internal standard used for quantitation and surrogate compound used to correct analytical results

Compound used in calibration, but not reported

Table 4. Saturated Hydrocarbons Target List

Compound	Reporting Code	Compound	Reporting Code
n-Octane (optional)	C8	n-Hexacosane	C26
n-Nonane	C9	n-Heptacosane	C27
n-Decane	C10	n-Octacosane	C28
n-Undecane	C11	n-Nonacosane	C29
n-Dodecane	C12	n-Triacontane	C30
n-Tridecane	C13	n-Hentriacontane	C31
Isoprenoid RRT 1380	1380	n-Dotriacontane	C32
n-Tetradecane	C14	n-Tritriacontane	C33
Isoprenoid RRT 1470	1470	n-Tetratriacontane	C34
n-Pentadecane	C15	n-Pentatriacontane	C35
Isoprenoid RRT 1650	1650	n-Hexatriacontane	C36
n-Hexadecane	C16	n-Heptatriacontane	C37
n-Heptadecane	C17	n-Octatriacontane	C38
Pristane	PRIS	n-Nonatriacontane	C39
n-Octadecane	C18	n-Tetracontane	C40
Phytane	PHYT	Total Hydrocarbons	TPH
n-Nonadecane	C19		
n-Eicosane	C20	Surrogate Compounds	
n-Heneicosane	C21	Tetracosane-d50	D50T
n-Docosane	C22	5a-Androstane	5AA
n-Tricosane	C23		
n-Tetracosane	C24	Internal Standard	
n-Pentacosane	C25	Triacontane-d62	D62T

Internal Standard/Surrogate Reference indicates internal standard used for quantitation and surrogate compound used to correct analytical results

Also used in reporting:
TOTRES: Total of resolved compounds in sample extract
TPH: Total of resolved and unresolved compounds in sample extract

Table 5. Diagnostic Ratios and Parameters of Saturated Hydrocarbons, Polynuclear Aromatic Hydrocarbons, and Steranes and Triterpanes

Parameter	Relevance in Environmental Samples
Saturated Hydrocarbons (SHC)	
Isoprenoids	The sum of selected branched isoprenoid alkanes including: phytane, pristane, farnesane [1470], and unidentified isoprenoids at relative retention indices 1380 and 1650. Isoprenoids are abundant in petroleum and are resistant to degradation relative to the corresponding n-alkanes.
LALK	The sum of lower-molecular-weight n-alkanes (n-C_9 to n-C_{20}) generally associated with "fresh" petroleum inputs.
TALK	The sum of total alkanes, which includes those of biogenic and petrogenic origin (n-C_9 to n-C_{40}).
LALK/TALK	Diagnostic alkane compositional ratio used to determine the relative abundance of lower-molecular-weight alkanes, which includes those of biogenic origin.
PHY/PRIS	Source of phytane (PHY) is mainly petroleum, whereas pristane (PRIS) is derived from both biological matter and oil. In "clean" environmental samples, this ratio is very low and increases as oil is added.
n-C_{16}/(n-C_{15} +n-C_{17})	The ratio of n-alkane hexadecane (n-C_{16}) over pentadecane (n-C_{15}) and heptadecane (n-C_{17}). At "background" levels of total hydrocarbons n-C_{15} and n-C_{17} can be used as indicators of plankton (algal) hydrocarbon inputs. As plankton productivity increases, the ratio decreases.
CPI	Carbon Preference Index. Describes the relative amounts of odd- and even-chain alkanes within a specific alkane boiling range [CPI = (n-C_{27}+ n-C_{29}+ n-C_{31})/(n-C_{26}+ n-C_{28}+ n-C_{30})]. CPI of 2 - 4 indicates terrestrial plants; as oil additions increase, the CPI is lowered to near 1.0.
TPH	Total Saturated Hydrocarbons. The sum of the resolved plus unresolved saturated hydrocarbons.
TPH (resolved)	The sum o f the resolved saturated hydrocarbons.
Polynuclear Aromatic Hydrocarbons (PAH)	
N/P	The naphthalenes (N) to phenanthrenes/anthracenes (P) ratio is diagnostic for inputs of fresh petroleum, and as a weathering indicator. Naphthalenes are characteristic of fresh crude oil; the ratio decreases with increased weathering. (N= Naphthalene series [C0N + C1N + C2N + C3N + C4N]; P= Phenanthrene/Anthracene Series [C0P/A + C1P/A + C2P/A + C3P/A + C4P/A]).
C2D/C2P	Ratio of C2 alkyl dibenzothiophenes (D) and C2 alkyl phenanthrenes (P) is a useful diagnostic source ratio for petroleum, coal and coal tars.
C3D/C3P	Ratio of C3 alkyl dibenzothiophenes (D) and C3 alkyl phenanthrenes (P) is a useful diagnostic source ratio for petroleum, coal and coal tars..
Fl/Py	The ratio of Fluoranthene/Pyrene, two primarily pyrogenic PAH, can be useful in distinguishing between different combustion sources, including coal tars, creosotes, and background fossil fuel combustion.
(Fl+Py)/C1 to C3 Fl	The ratio of the sum of Fluoranthene and Pyrene / sum C1- to C3-Floranthene can be useful in distinguishing between different pyrogenic and petrogenic sources..
Perylene	A biogenic PAH formed during the early diagenesis in marine and lacustrine sediments; may be associated with terrestrial plant source precursors.
Total PAH	The sum of all PAH target analytes; includes 2- through 6-ring parent PAH and C1 - C4 alkyl-substituted PAH.
Total PAH less perylene	The sum of all PAH target analytes with the exception of perylene.

Table 5 (continued). Diagnostic Ratios and Parameters of Saturated Hydrocarbons, Polynuclear Aromatic Hydrocarbons, and Steranes and Triterpanes

Parameter	Relevance in Environmental Samples
Polynuclear Aromatic Hydrocarbons (PAH) continued	
Pyrogenic PAH	The sum of combustion PAH compounds (4-, 5-, and 6-ring PAH: fluoranthene, pyrene, chrysene, benzo[a]anthracene, benzo[b]fluoranthene, benzo[k]fluoranthene, benzo[a]pyrene, dibenz[a,h]anthracene, benzo[g,h,i]perylene, and indeno[1,2,3,-c,d]pyrene.
Petrogenic PAH	The sum of petrogenic PAH compounds (2-, 3-, and 4-ring PAH: naphthalenes [C0 - C4], acenaphthene, acenaphthylene, fluorene [C0 - C3], phenanthrenes [C0 - C4], dibenzothiophenes [C0 - C3], chrysenes [C1 - C4], and fluoranthenes/pyrenes [C1 - C3]).
Pyrogenic/Petrogenic	The ratio of pyrogenic PAH compounds to petrogenic PAH compounds is useful for determining the relative contribution of pyrogenic and petrogenic hydrocarbons and in differentiating hydrocarbon sources.
Steranes/Triterpanes (ST)	
Total ST	The sum of all sterane and triterpane biomarker target analytes.
T21/T22	The ratio of C31-homohopane (22S) (T21) to C31-homohopane (22R) (T22); useful for determining the contribution of recent biogenic material.
Hopane	C30-Hopane (T19), commonly one of the most abundant triterpanes in petroleum.
Ts/(Ts +Tm)	Ratio of C27-trisnorhopane (Ts) to C27-trisnorhopane (Tm); used as a maturity indicator for petroleum and also as a source ratio for different crude oils.
Oleanane/Hopane	The ratio of C30-oleanane (T18) to C30-hopane (T19); indicates the relative amounts of oleanane, which is a marker of angiosperm (post-Cretaceous) contribution to petroleum diagenesis.

Table 6. Summary of sample concentrations for Total PAH, Total ST, TPH (total), and TPH (resolved)

Sample Location	River Location (relative to site)	Sample Area	Units	Total PAH	Total ST	TPH (total)	TPH (resolved)
US-10	-10	Background	ng/g	8,093	2,736	516,100	24,648
US-10 (PAH-4)	-10	Background	ng/g	8,117	3,228	595,703	39,283
US-10 (PAH-3)	-10	Background	ng/g	8,193	3,275	658,038	36,812
US-9	-9	Upstream	ng/g	7,901	2,218	478,297	46,173
US-8	-8	Upstream	ng/g	11,390	2,720	593,324	25,594
US-7	-7	Upstream	ng/g	10,045	3,185	514,821	24,475
PAH-1	-5	Across River	ng/g	8,682	2,353	460,442	36,861
PAH-2	-3.5	Upstream	ng/g	9,490	2,781	492,179	17,527
US-3	-3	Upstream	ng/g	10,647	2,393	464,749	36,556
US-2	-2	Upstream	ng/g	21,524	10,167	2,570,319	163,186
US-1	-1	Upstream	ng/g	7,385	2,007	368,807	24,366
NA-3	-0.5	Upstream	ng/g	13,927	2,879	623,069	46,079
A-06	0	Area A	ng/g	360,127	4,086	3,053,006	868,010
A-07	0	Area A	ng/g	747,913	3,775	4,031,290	1,576,776
A-16	0	Area A	ng/g	46,875	2,034	590,747	94,212
A-23	0	Area A	ng/g	34,119	2,133	619,374	72,822
A-25	0	Area A	ng/g	31,725	1,749	577,730	70,165
A-44	0	Area A	ng/g	15,714	2,370	507,922	37,117
B-13	0	Area B	ng/g	8,502	2,296	560,036	38,503
B-13 Dup	0	Area B	ng/g	10,553	2,753	578,226	37,649
B-16	0	Area B	ng/g	10,990	3,247	664,419	45,193
B-19	0	Area B	ng/g	6,935	2,432	561,850	22,581
DS-2	2	Downstream	ng/g	25,748	3,015	717,121	65,302
DS-2 Dup	2	Downstream	ng/g	24,257	2,423	541,440	38,754
DS-3	3	Downstream	ng/g	18,530	3,534	658,932	46,818
DS-5	5	Downstream	ng/g	21,530	2,398	525,674	42,426
DS-8	8	Downstream	ng/g	7,006	1,949	421,614	43,031
DS-10	10	Downstream	ng/g	13,252	6,345	1,419,968	74,937
A-11 Core	0	Area A	ng/g	24,768,120	12,735	50,177,158	38,218,546
A-14 Core	0	Area A	ng/g	317,693	4,427	1,904,637	566,543
A-20 Core	0	Area A	ng/g	278,275	12,016	3,711,330	501,943
R-1 Core	0	Offsite	ng/g	4,118,902	11,862	11,263,733	6,483,487
MW-105D	0	NAPL	mg/Kg	265,861	62	628,132	445,206
MW-116BD	0	NAPL	mg/Kg	352,836	54	771,701	612,375
MW-102AD	0	NAPL	mg/Kg	358,785	19	813,157	610,156
Bulkhead Sheen	0	Sheen	mg/Kg	472,713	121	1,004,708	749,551

Table 7. Summary of the FALCON Model data output showing best fit estimates for mixtures of background hydrocarbons with the site coal tar and predicted PAH concentrations

Sample ID	Best Fit Based on FALCON Model*	Total PAH (ng/g)	Additional PAH in Sample Based on FALCON Best Fit (ng/g)	Additional PAH above Background – Using Absolute TPAH (ng/g)
US-10 (PAH-3)	Background	8,093	0	0
US-10 (PAH-4)	Background	8,193	0	59
US-10	Background	8,117	0	0
US-9	Background	7,901	0	0
US-8	Background	11,390	0	3,256
US-7	Background	10,045	0	1,911
Across River (PAH-1)	Background	8,682	0	548
PAH-2	Background	9,490	0	1,356
US-3	Background	10,647	0	2,513
US-2	Background	21,524	0	13,390
US-1	Background	7,385	0	0
NA-3	Background	13,927	0	5,793
A-06	BKGD + 5000 ug/g	360,127	1,629,137	351,993
A-07	BKGD + 25000 ug/g	747,913	8,145,683	739,779
A-16	BKGD + 100 ug/g	46,875	32,583	38,741
A-23	BKGD + 10 ug/g	34,119	3,258	25,985
A-25	BKGD + 10 ug/g	31,725	3,258	23,591
A-44	BKGD + 5 ug/g	15,714	1,629	7,580
B-13	Background	8,502	0	368
B-13 Dup	BKGD + 5 ug/g	10,553	1,629	2,419
B-16	Background	10,990	0	2,856
B-19	Background	6,935	0	0
DS-2	BKGD + 5 ug/g	25,748	1,629	17,614
DS-2 Dup	BKGD + 10 ug/g	24,257	3,258	16,123
DS-3	BKGD + 5 ug/g	18,530	1,629	10,396
DS-5	BKGD + 10 ug/g	21,530	3,258	13,396
DS-8	Background	7,006	0	0
DS-10	Background	13,252	0	5,118
A-11 Core	BKGD + 5000 ug/g	24,768,120	1,629,137	24,759,986
A-14 Core	BKGD + 1000 ug/g	317,693	325,827	309,559
A-20 Core	BKGD + 500 ug/g	278,275	162,914	270,141
R-1 Core	BKGD + 5000 ug/g	4,118,902	1,629,137	4,110,768

* Best Fit = Background + model output concentration of coal tar (if any) in ug/g sediment

Table 8. Summary of the cumulative findings of all fingerprinting parameters

Sample Location Code	Sample Depth (feet)	River Location (relative to site)	Sample Area	Collection Date	TPH Chromatograms	Biomarkers	PAH Histograms	TPH, PAH, and ST Line Graphs	TPH resolved/TPH	Double Ratio Plots	PCA	FALCON Analysis	Weight of Evidence Conclusion
US-9	0-0.5	-9.0	Upstream	10/30/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
US-8	0-0.5	-8.0	Upstream	10/30/06	BKDG	BKDG contribution	BKDG with enhanced pyrogenic contribution	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Possible enrichment of pyrogenic PAH	BKDG	BKDG	**No evidence of site-related hydrocarbons**
US-7	0-0.5	-7.0	Upstream	10/30/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
PAH-1	0-0.5	-5.0	Across River	10/31/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
PAH-2	0-0.5	-3.5	Upstream	10/30/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
US-3	0-0.5	-3.0	Upstream	10/30/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
US-2	0-0.5	-2.0	Upstream	10/30/06	BKDG plus heavy petroleum	BKDG plus petroleum	BKDG plus petroleum	Sample enriched in TPH and ST indicating petroleum contribution	Similar to BKDG	Similar to BKDG	BKDG + Petroleum?	BKDG	**No evidence of site-related hydrocarbons**
US-1	0-0.5	-1.0	Upstream	10/30/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKDG	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
NA-3	0-0.5	-0.5	Upstream	12/07/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKGD	Similar to BKDG	Possible enrichment of pyrogenic PAH	BKDG	BKDG	**No evidence of site-related hydrocarbons**
A-06	0-0.5	0.0	Area A	10/24/06	Weathered coal tar with BKDG	BKDG contribution	Weathered coal tar with BKDG	Sample enriched in TPH and PAH	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 5000 ug/g	**Sediment impacted by substantial site-related NAPL**
A-07	0-0.5	0.0	Area A	10/24/06	Weathered coal tar with BKDG	BKDG contribution	Weathered coal tar with BKDG	Sample enriched in TPH and PAH	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 25000 ug/g	**Sediment impacted by substantial site-related NAPL**
A-16	0-0.5	0.0	Area A	10/30/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with weathered coal tar	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	BKDG + Coal Tar?	BKGD + 100 ug/g	**Sediment impacted by site-related NAPL**
A-23	0-0.5	0.0	Area A	10/24/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with weathered coal tar	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	BKDG	BKGD + 10 ug/g	**Sediment impacted by site-related NAPL**
A-25	0-0.5	0.0	Area A	10/24/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with weathered coal tar	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	BKDG	BKGD + 10 ug/g	**Sediment impacted by site-related NAPL**
A-44	0-0.5	0.0	Area A	11/13/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with enhanced pyrogenics (weathered coal tar?)	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Similar to BKDG	Possible enrichment of pyrogenic PAH	BKDG	BKGD + 5 ug/g	**Sediment impacted by trace level site-related NAPL**
B-13	0-0.5	0.0	Area B	12/07/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
B-13 Dup	0-0.5	0.0	Area B	12/07/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKGD + 5 ug/g	**No evidence of site-related hydrocarbons**
B-16	0-0.5	0.0	Area B	11/13/06	BKDG	BKDG contribution	BKDG	Sample slightly enriched in TPH; PAH and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
B-19	0-0.5	0.0	Area B	10/24/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
DS-2	0-0.5	2.0	Downstream	10/31/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with enhanced pyrogenics (weathered coal tar?)	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKGD + 5 ug/g	**Sediment potentially impacted by trace site-related NAPL**
DS-2 Dup	0-0.5	2.0	Downstream	10/31/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with enhanced pyrogenics (weathered coal tar?)	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKGD + 10 ug/g	**Sediment potentially impacted by trace site-related NAPL**
DS-3	0-0.5	3.0	Downstream	10/31/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with enhanced pyrogenics (weathered coal tar?)	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKGD + 5 ug/g	**Sediment potentially impacted by trace site-related NAPL**
DS-5	0-0.5	5.0	Downstream	10/31/06	BKDG with enhanced pyrogenics	BKDG contribution	BKDG with enhanced pyrogenics (weathered coal tar?)	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Similar to BKDG	Possible enrichment of pyrogenic PAH	BKDG	BKGD + 10 ug/g	**Sediment potentially impacted by trace site-related NAPL**
DS-8	0-0.5	8.0	Downstream	10/31/06	BKDG	BKDG contribution	BKDG	TPH, PAH, and ST concentrations similar to BKGD	Similar to BKDG	Similar to BKDG	BKDG	BKDG	**No evidence of site-related hydrocarbons**
DS-10	0-0.5	10.0	Downstream	10/31/06	BKDG plus heavy petroleum	BKDG plus petroleum	BKDG plus petroleum	Sample enriched in TPH and ST indicating petroleum contribution	Similar to BKDG	Similar to BKDG	BKDG + Petroleum?	BKDG	**No evidence of site-related hydrocarbons**
A-11 core	17.5-18.5	0.0	Area A	12/01/06	Fresh coal tar	BKDG contribution	Fresh coal tar	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 5000 ug/g	**Sediment impacted by substantial site-related NAPL**
A-14 core	57-58	0.0	Area A	12/04/06	Fresh coal tar plus BKDG	BKDG contribution	Slightly weathered coal tar plus BKDG	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 1000 ug/g	**Sediment impacted by substantial site-related NAPL**
A-20 core	44-45	0.0	Area A	12/04/06	BKDG plus fresh coal tar	BKDG contribution	Slightly weathered coal tar plus BKDG	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 500 ug/g	**Sediment impacted by substantial site-related NAPL**
R-1 core	42.5-43.5	0.0	Offsite	12/05/06	Fresh coal tar	BKDG contribution	Fresh coal tar	Sample enriched (2-5x BKDG) in PAH; TPH and ST concentrations similar to BKGD	Sample enriched in resolved TPH	Sample enriched in pyrogenic PAH	Coal Tar + BKDG	BKGD + 5000 ug/g	**Sediment impacted by substantial site-related NAPL**

BKGD - Background
TPH - Total Petroluem Hydrocarbon
PAH - Polynuclear Aromatic Hydrocarbon
ST - Sterane and Triterpane Biomarkers

Figure 1
Honeywell Quanta Resources Site OU2 Sampling Locations
Edgewater, New Jersey

CH2MHILL

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N

0 90 180
Feet

DRAFT

Figure 2
Honeywell Quanta Resources Site OU2 Sampling Locations
Edgewater, New Jersey

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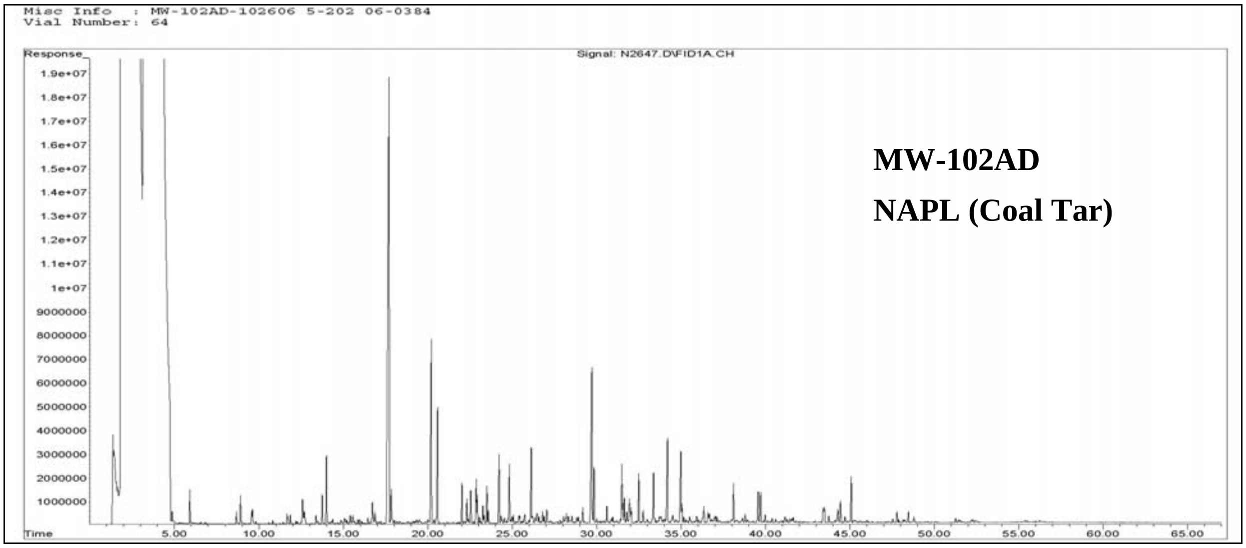
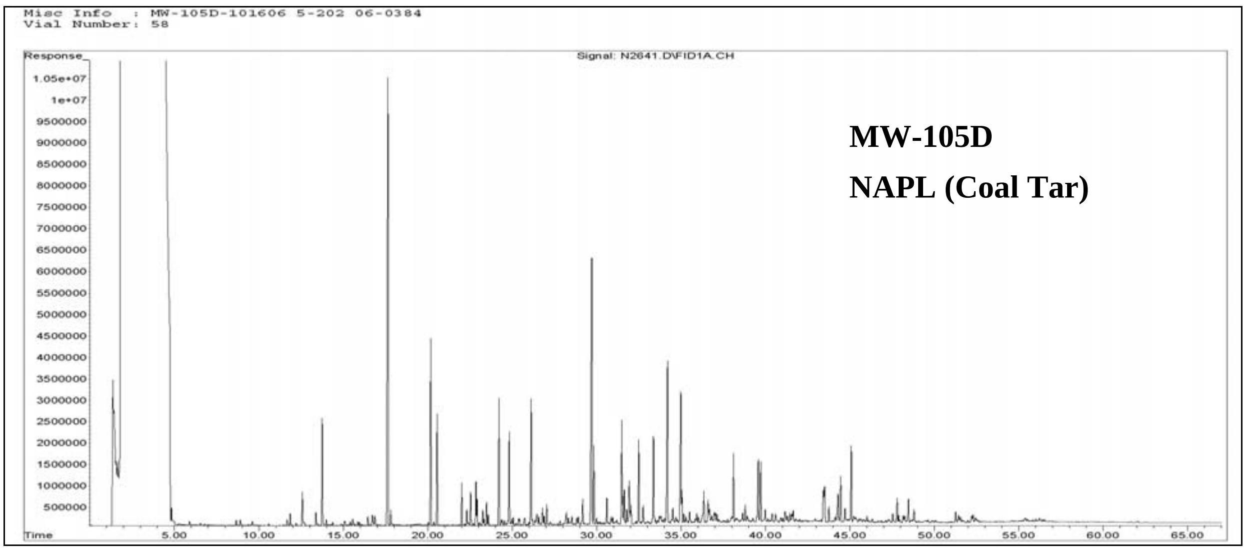
CH2MHILL

Figure 3. TPH Chromatograms for NAPL samples MW-102AD, MW-105D, and MW-116BD





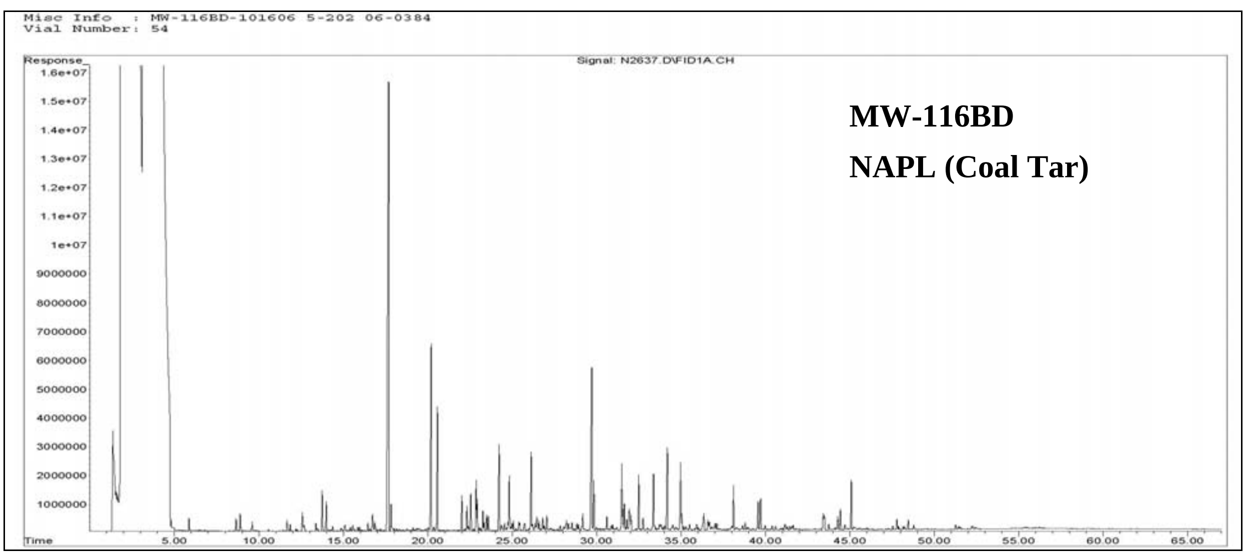
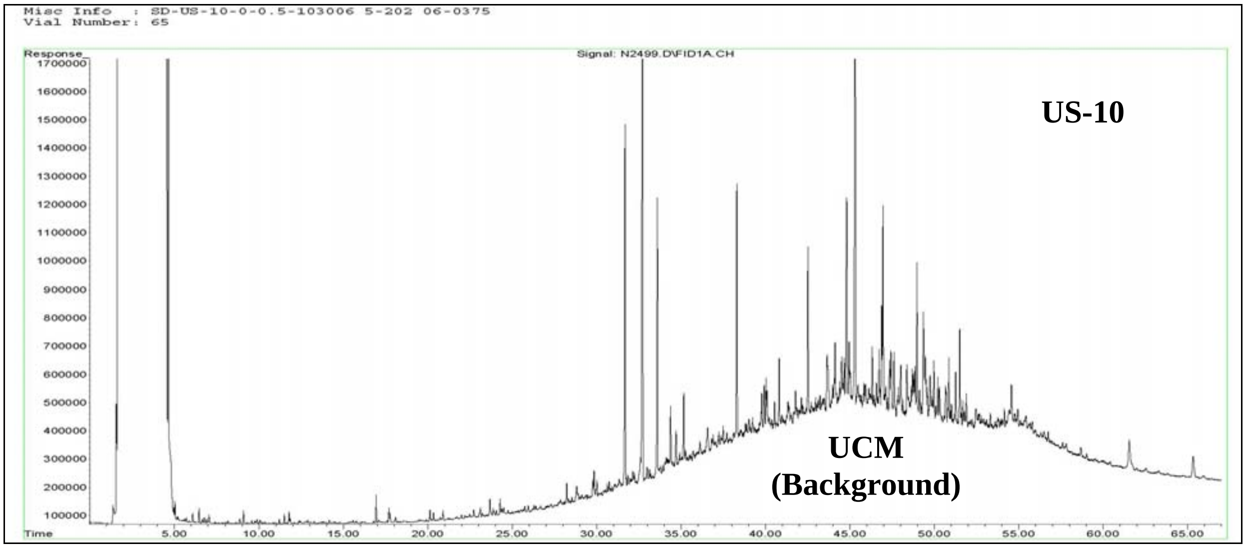
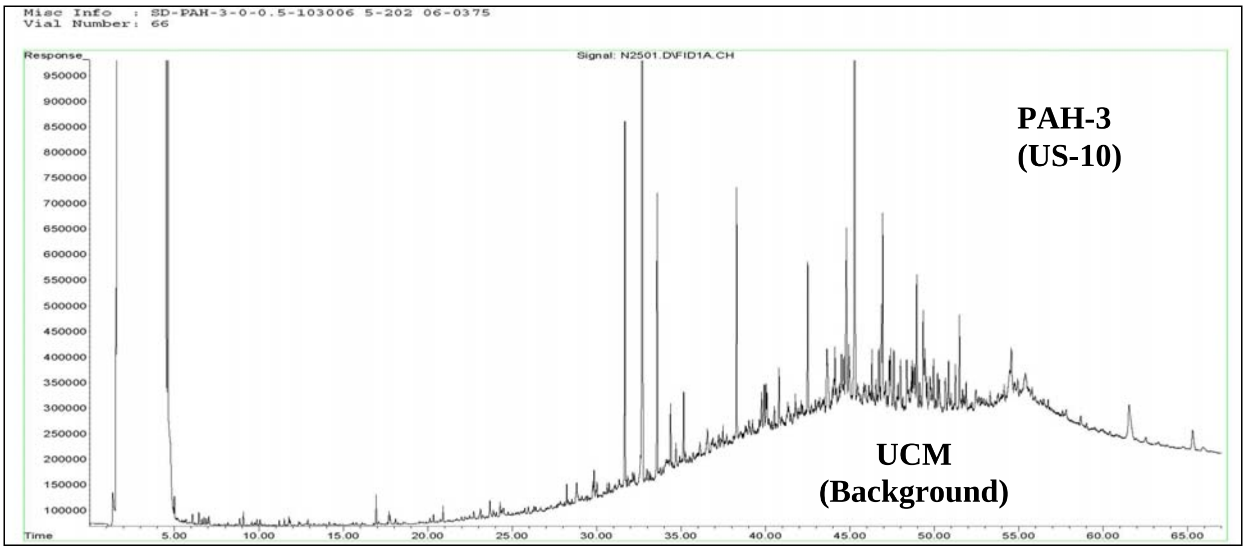


Figure 4. TPH Chromatograms for background samples US-10, PAH-3, and PAH-4.





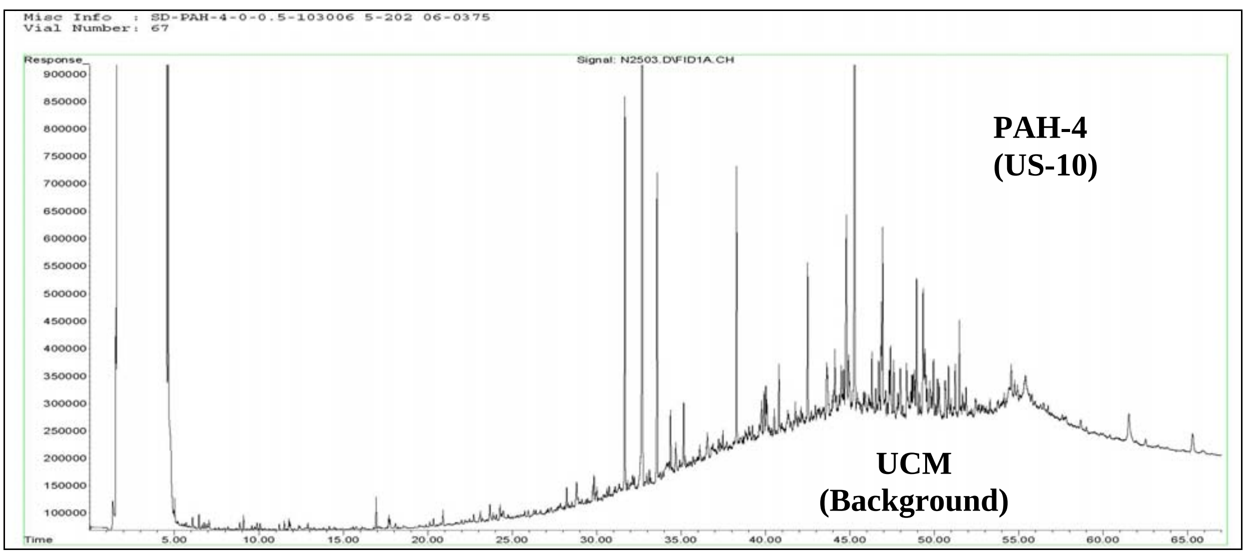


Figure 5. TPH Chromatograms for sediment samples US-9, B-19, and DS-8.

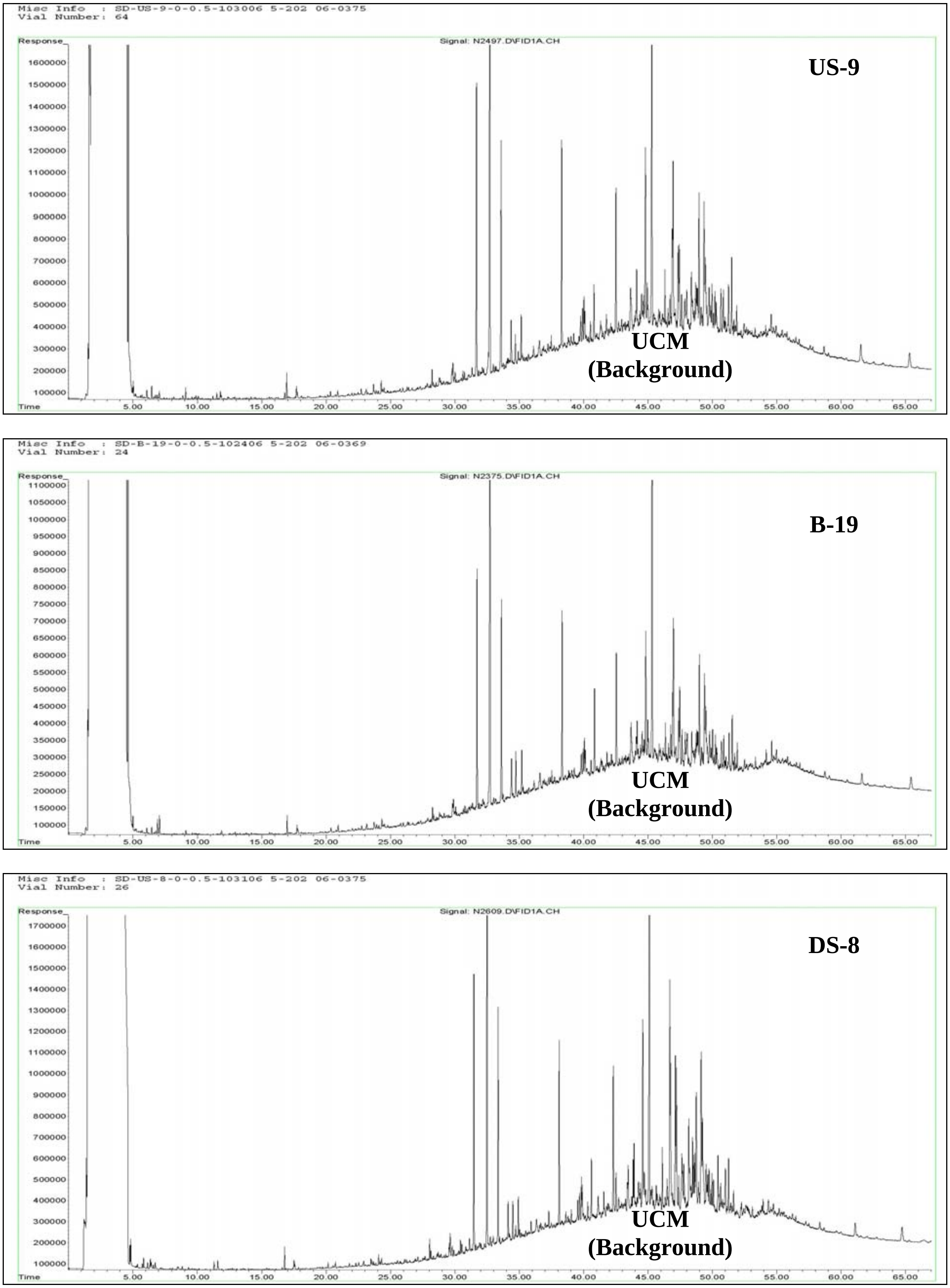
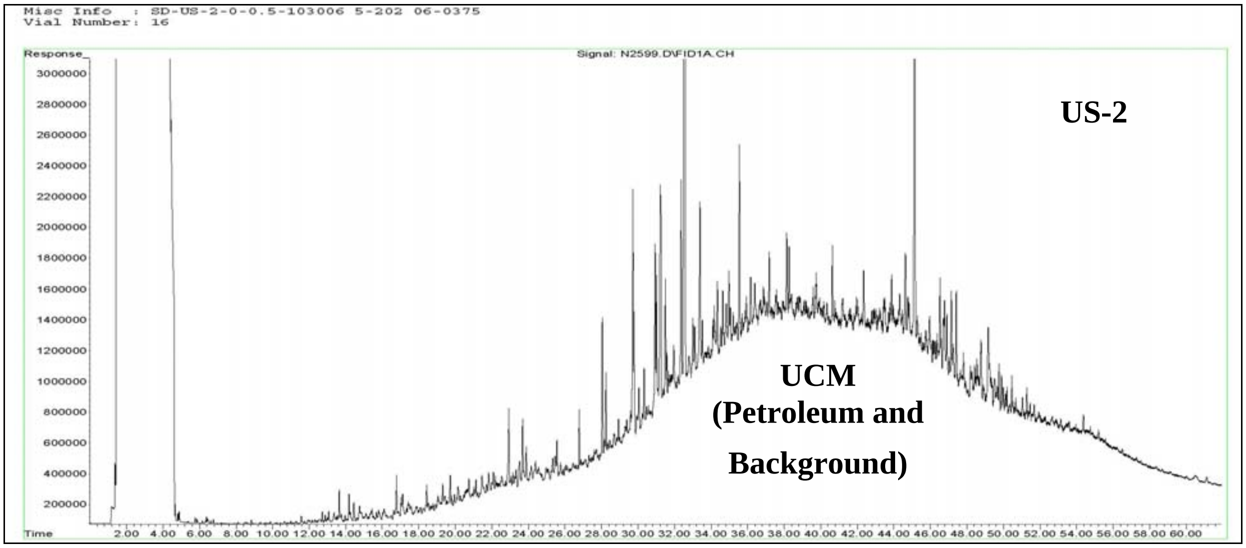


Figure 6. TPH Chromatograms for sediment samples US-2 and DS-10.



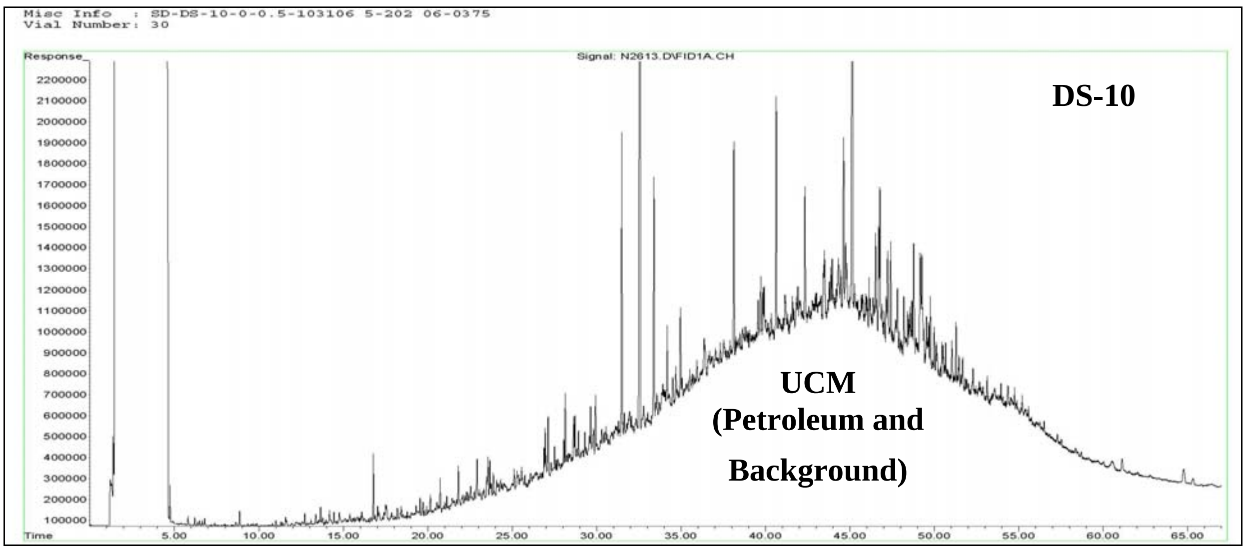


Figure 7. TPH Chromatograms for sediment core samples A-20, A-14, A-11, and R-1.

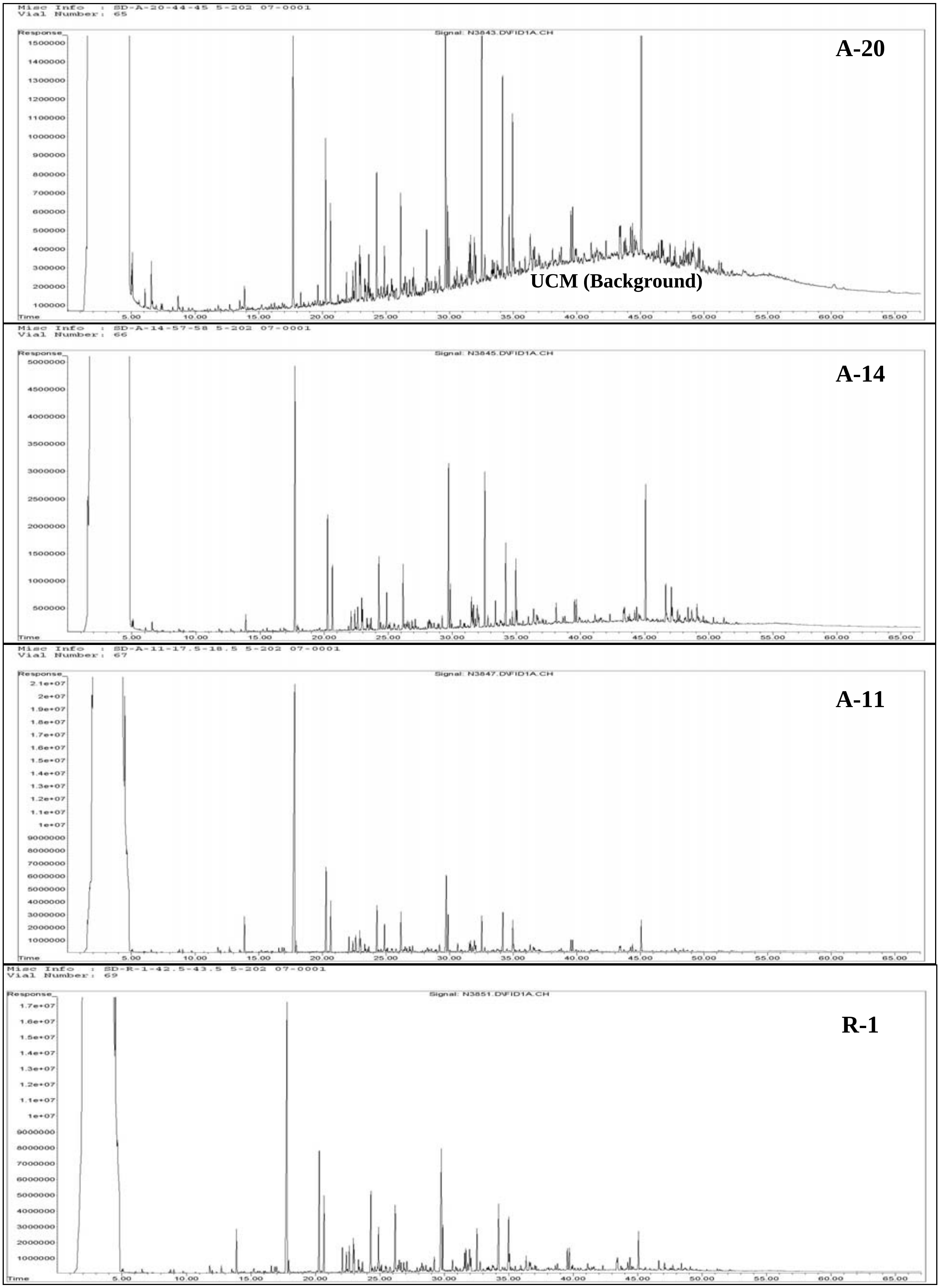
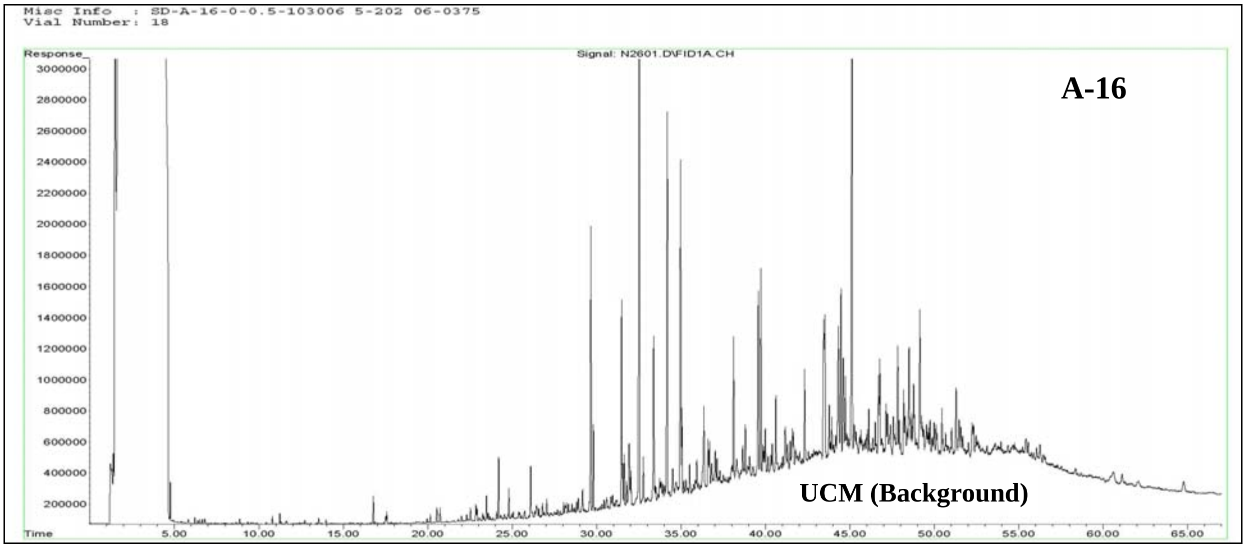
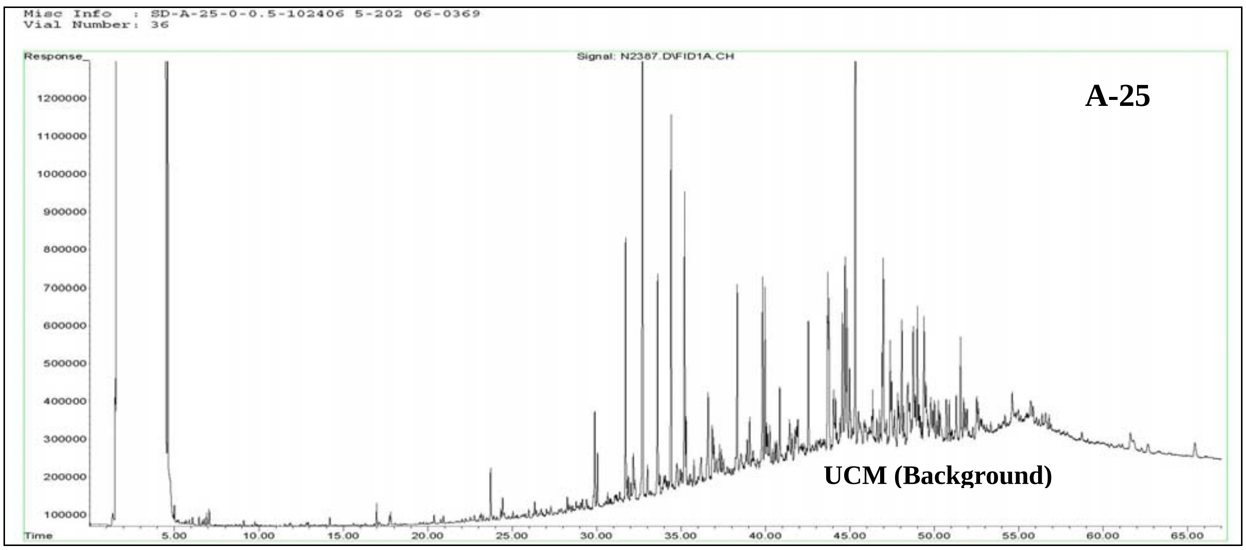


Figure 8. TPH Chromatograms for sediment samples A-16, A-25, and DS-3.





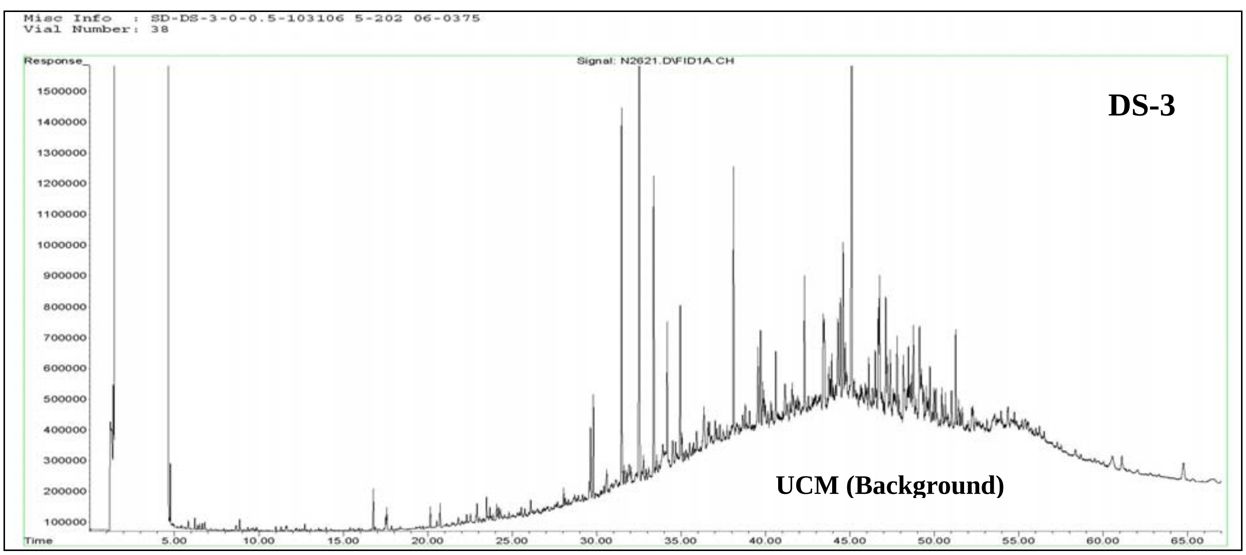
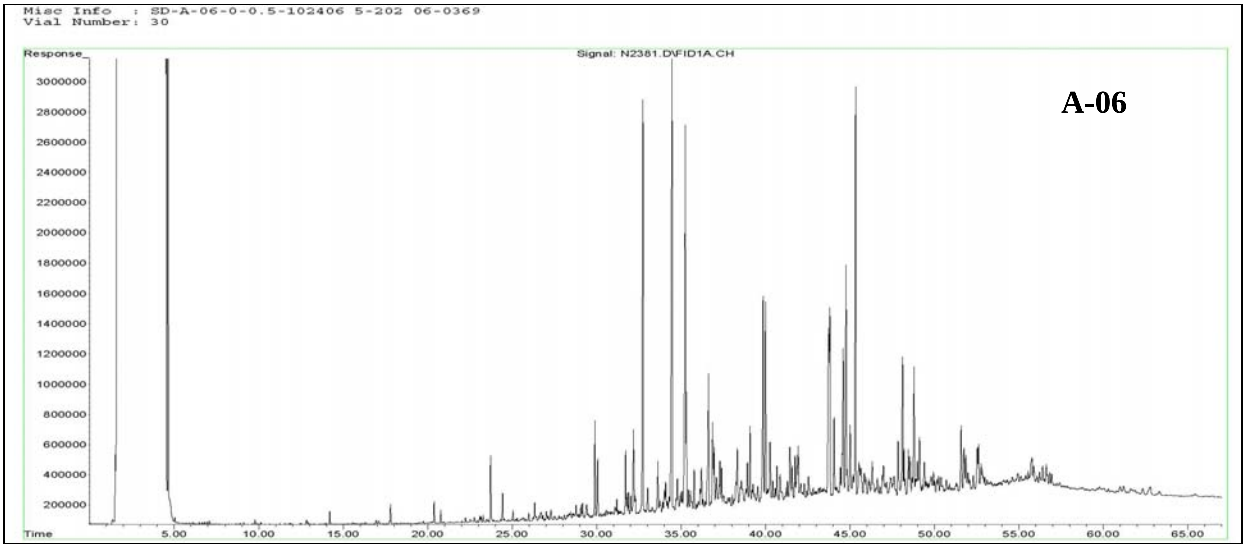
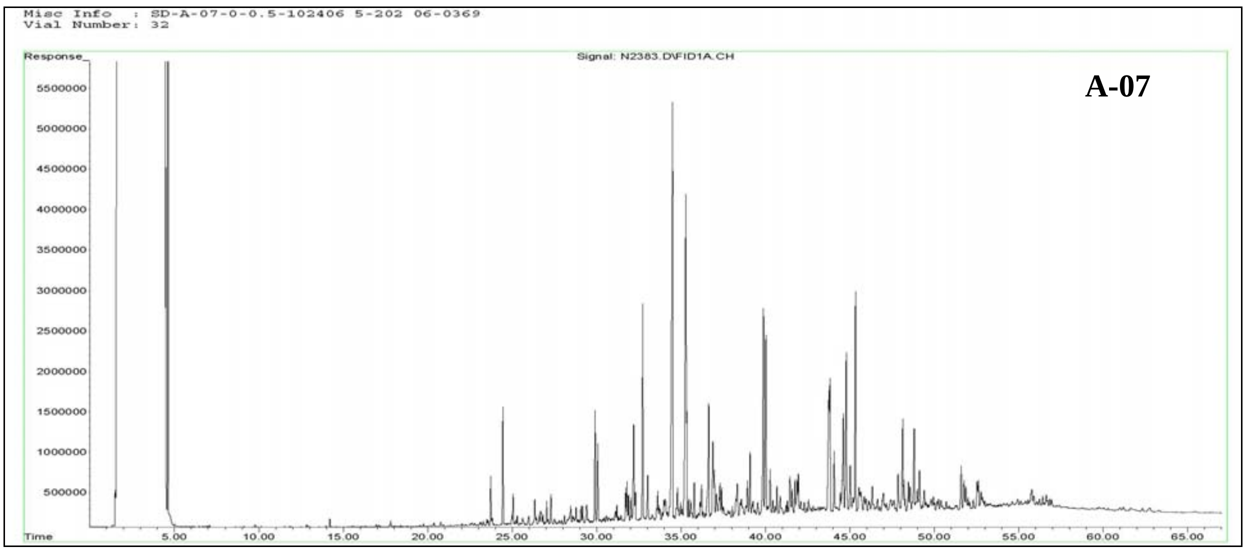


Figure 9. TPH Chromatograms for sediment samples A-06 and A-07, and sheen from Bulkhead-02.





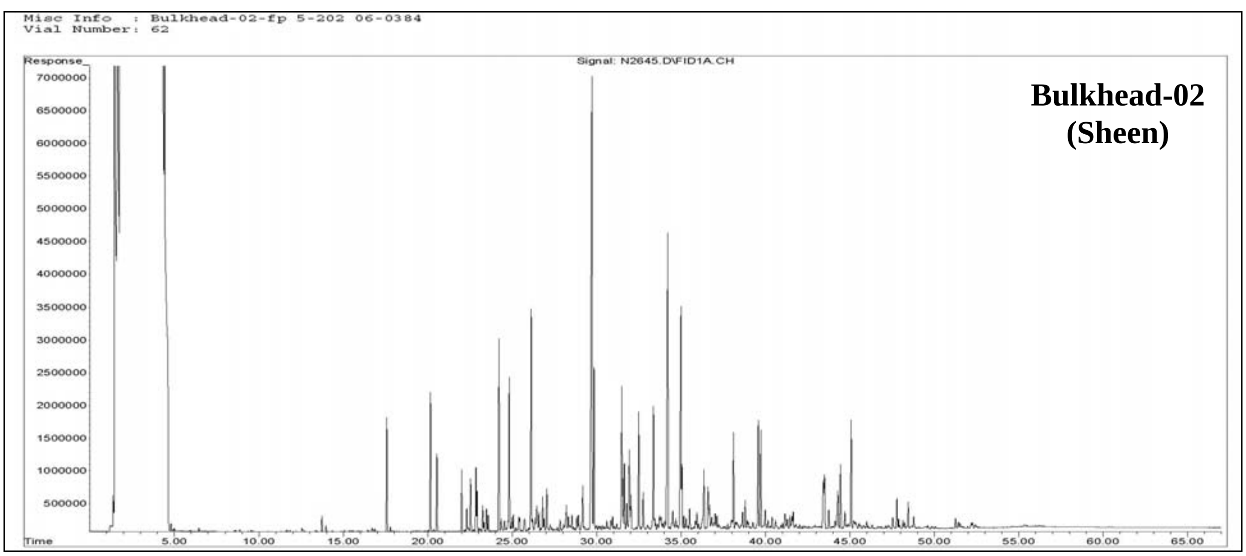


Figure 10. Triterpane EICPs for NAPL samples MW-102AD, MW-105D, and MW-116BD

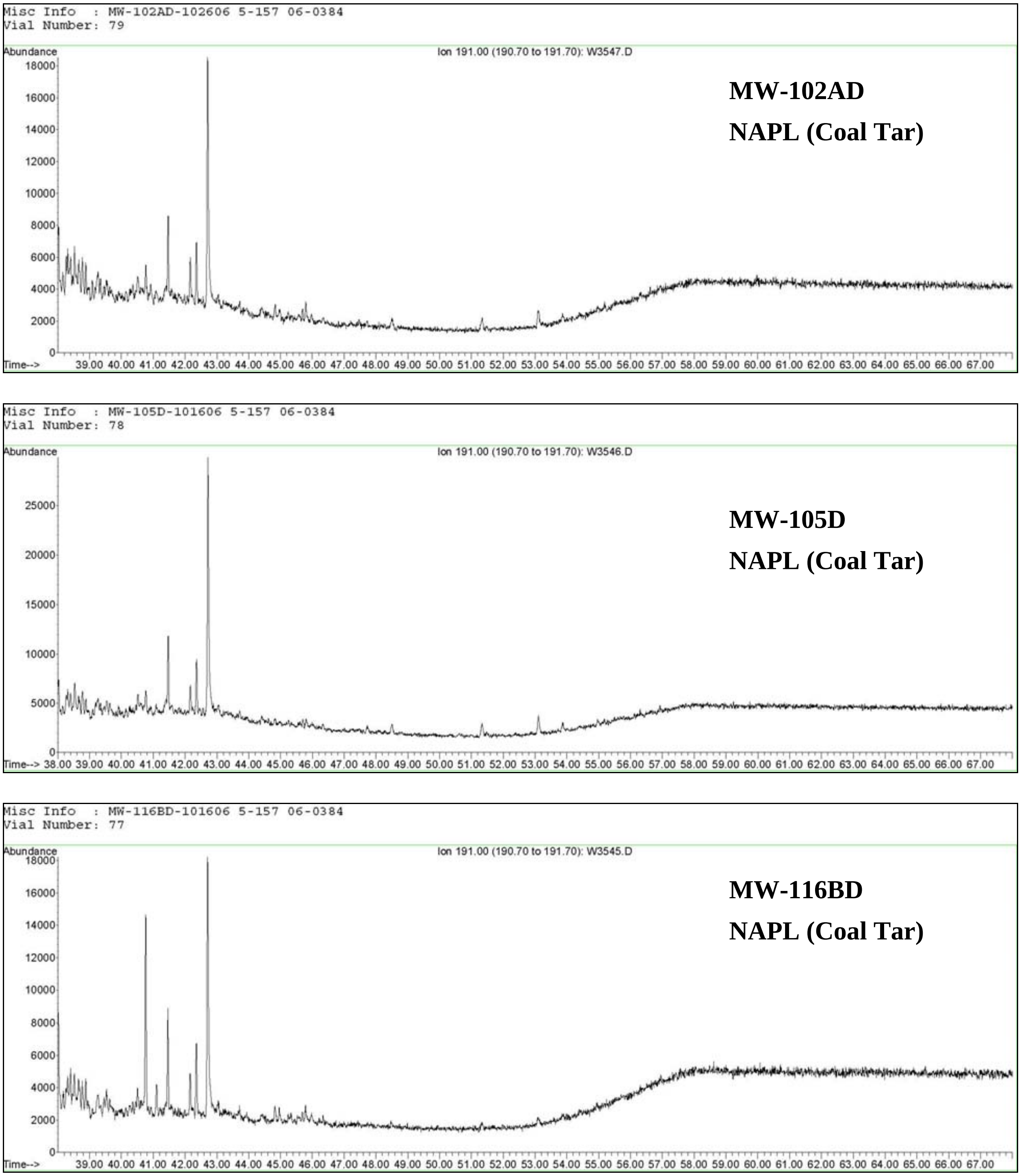
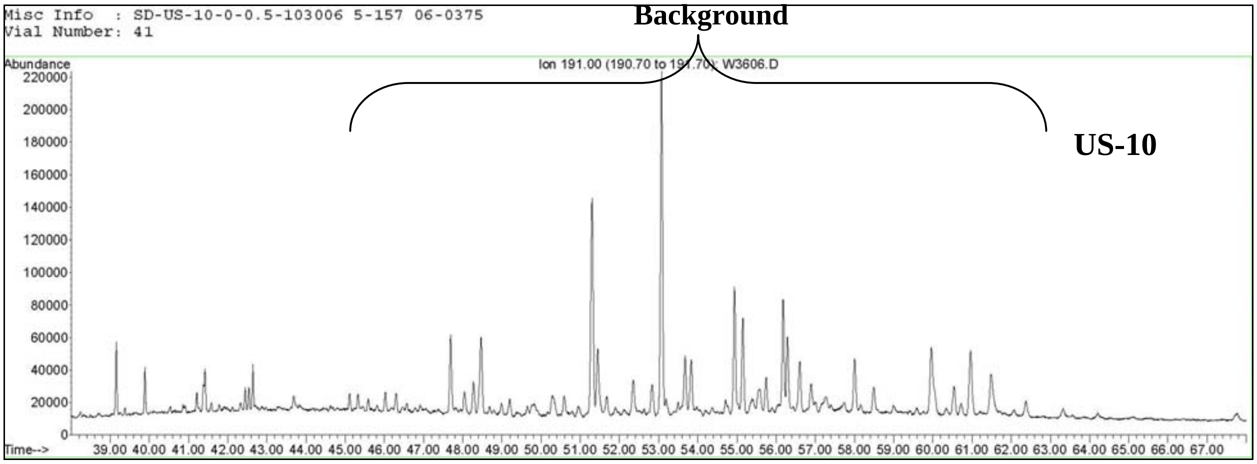
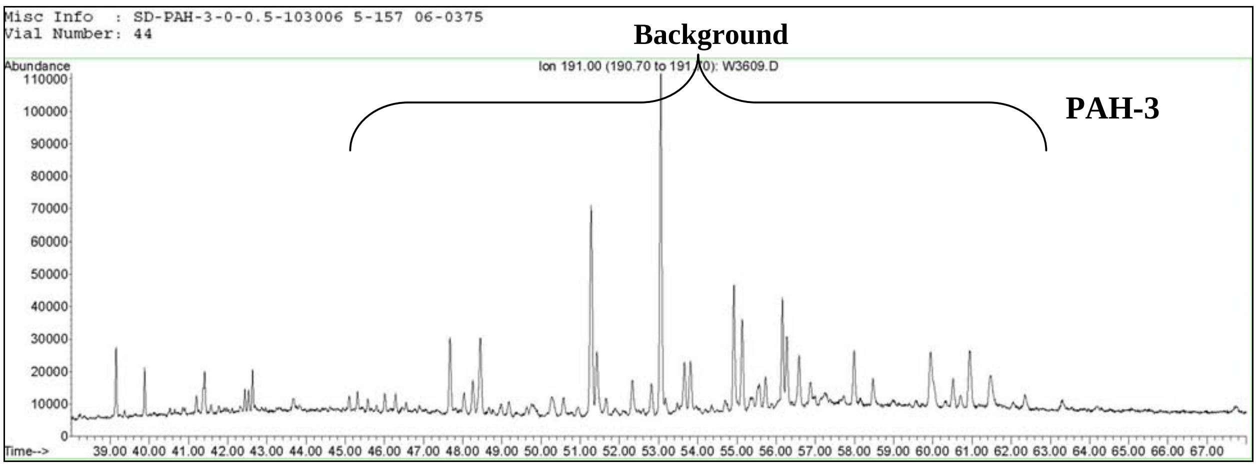


Figure 11. Triterpane EICPs for background samples US-10, PAH-3, and PAH-4.





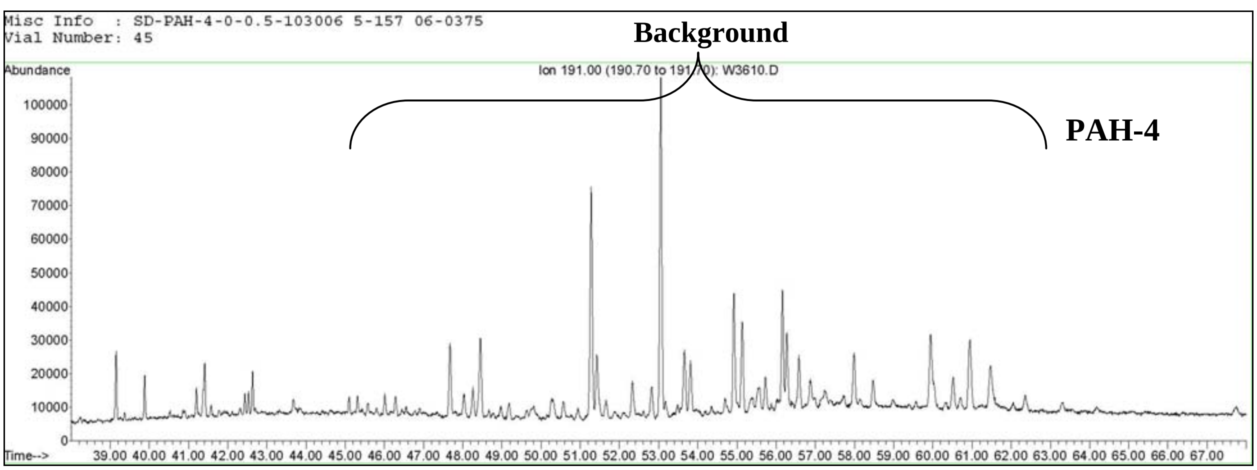


Figure 12. Triterpane EICPs for sediment samples US-9, B-19, and DS-8.

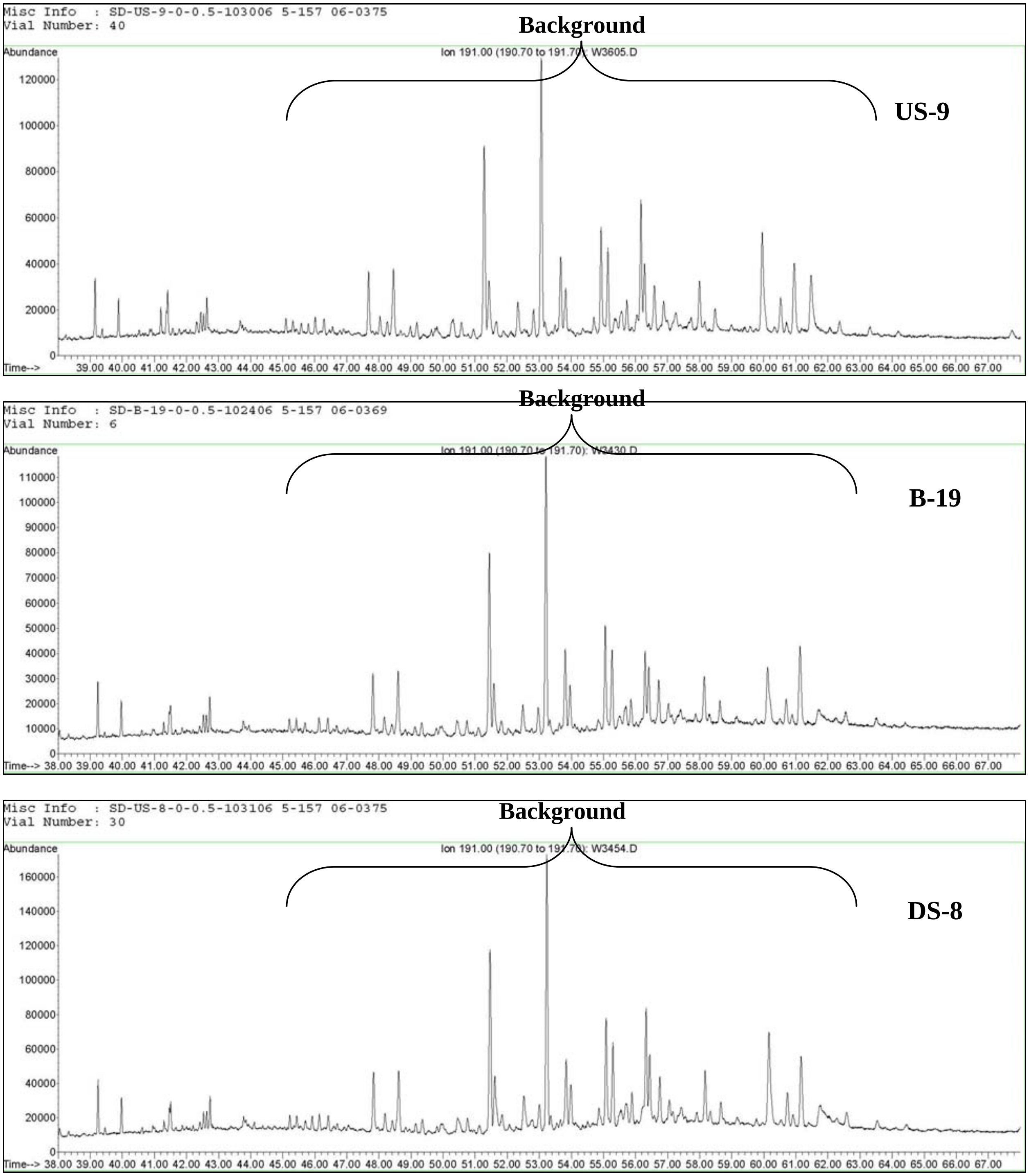


Figure 13. Triterpane EICPs for sediment samples US-2 and DS-10.

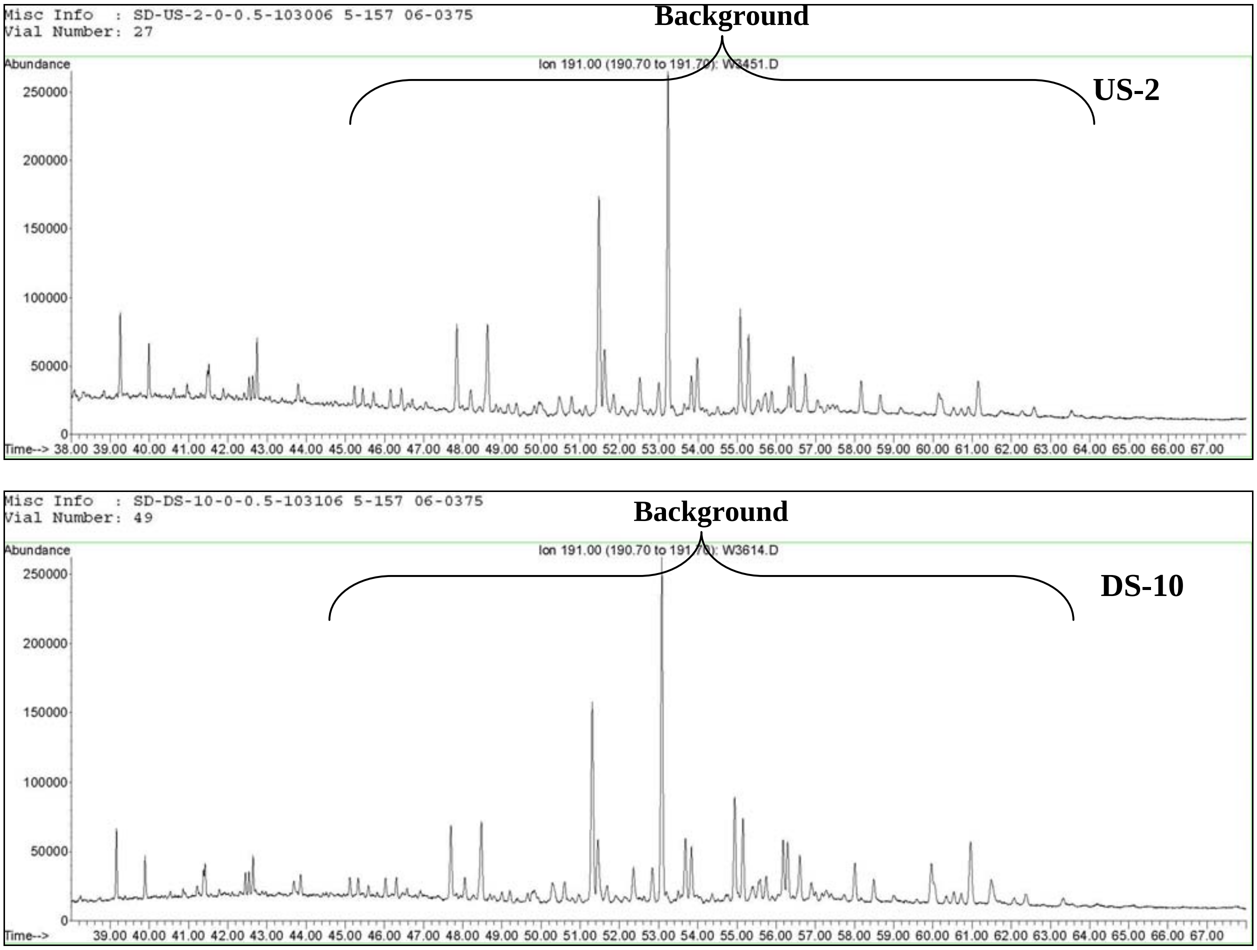


Figure 14. Triterpane EICPs for sediment core samples A-14, A-20, R-1 and A-11.

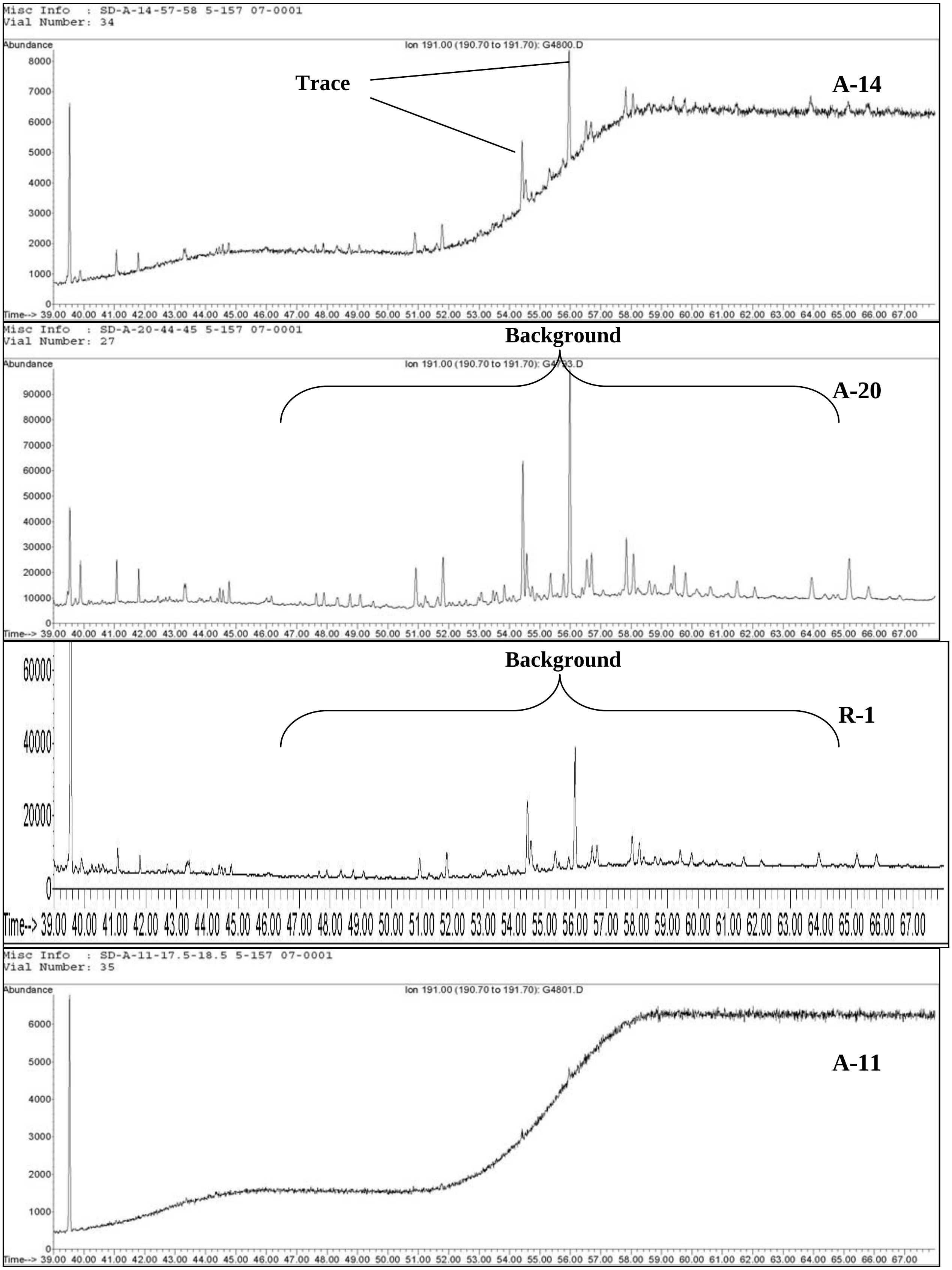
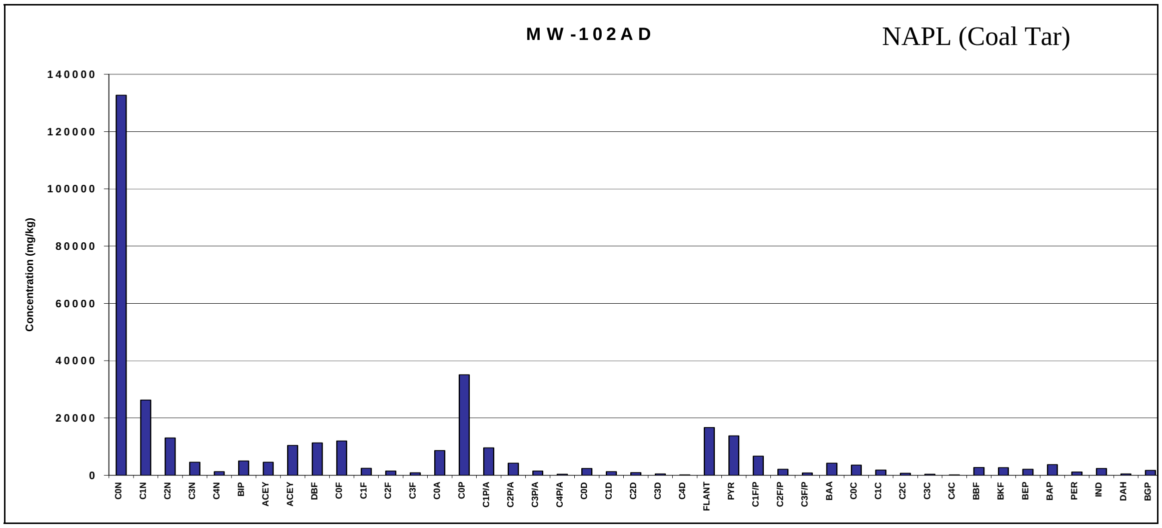
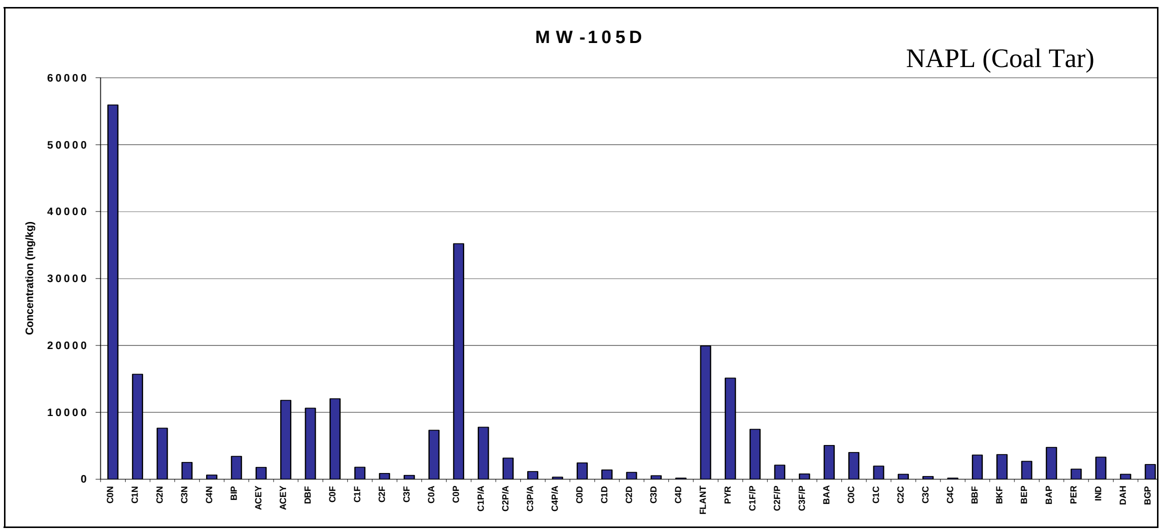


Figure 15. PAH Histograms for NAPL samples MW-102AD, MW-105D, and MW-116BD





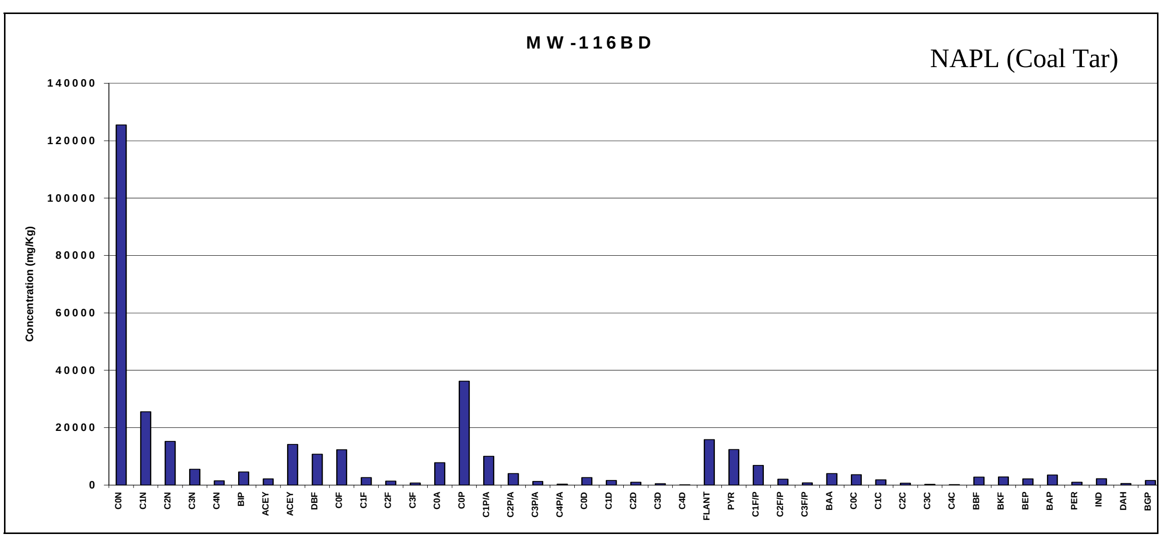
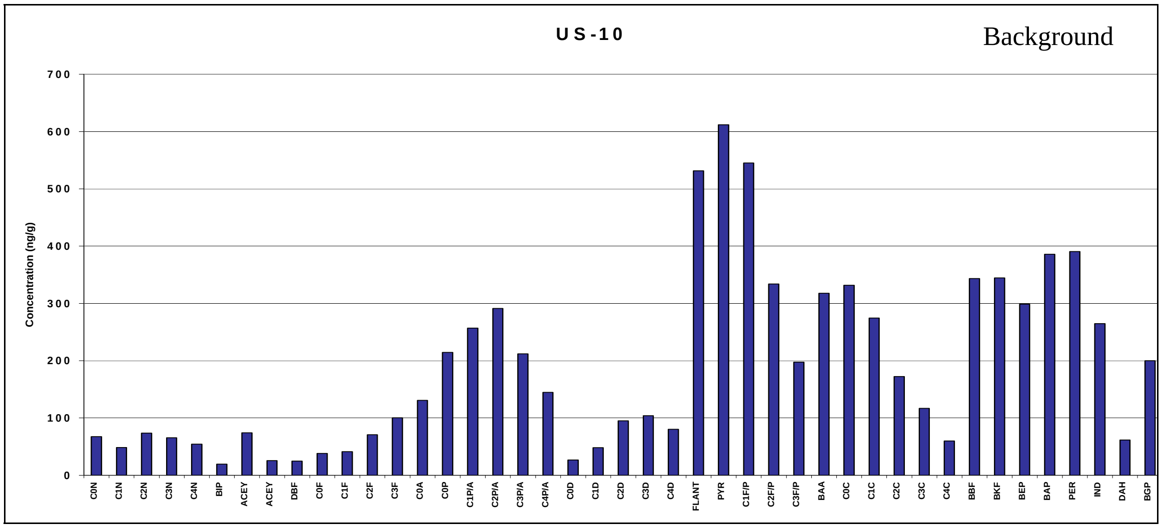
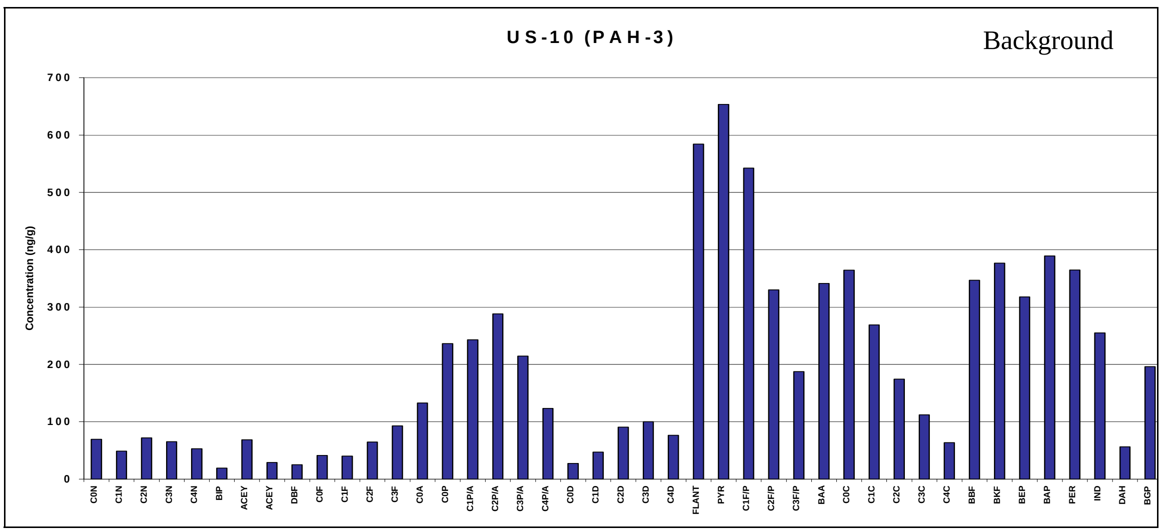


Figure 16. PAH Histograms for background samples US-10, PAH-3, and PAH-4.





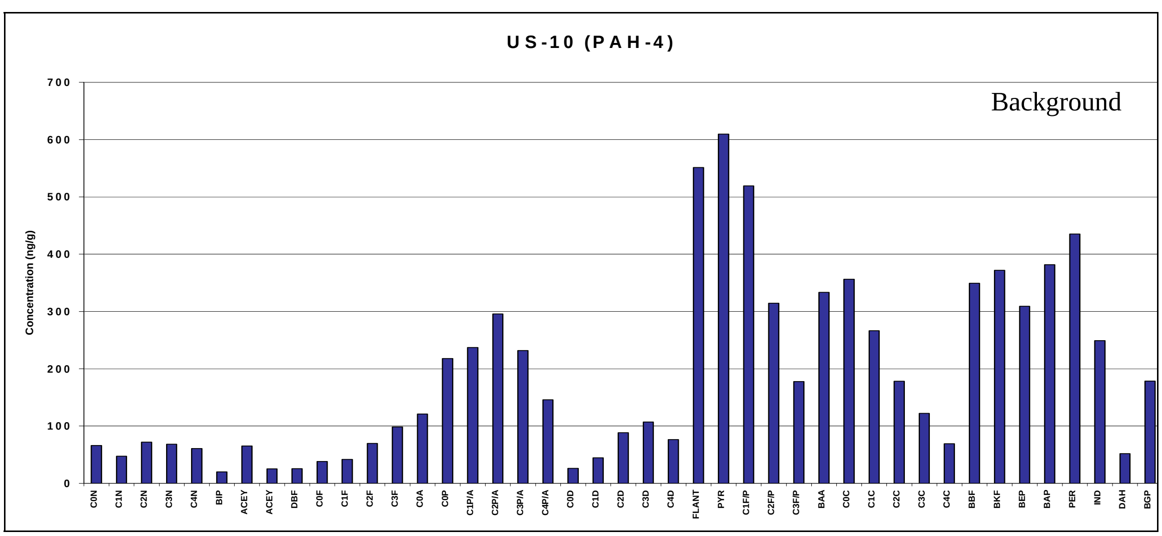


Figure 17. PAH Histograms for sediment samples US-9, B-19, and DS-8.

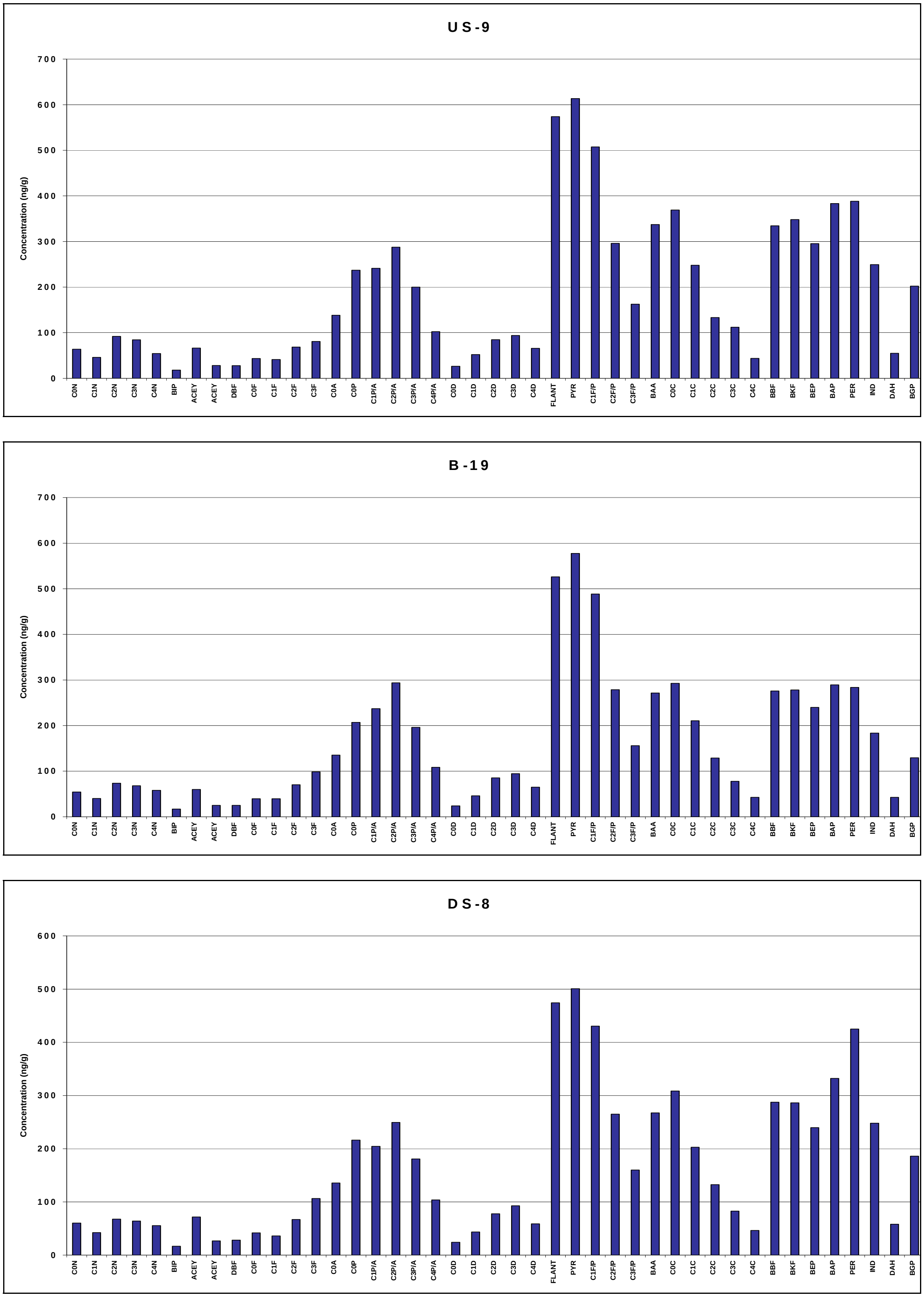


Figure 18. PAH Histograms for sediment samples US-8, US-2, and DS-10.

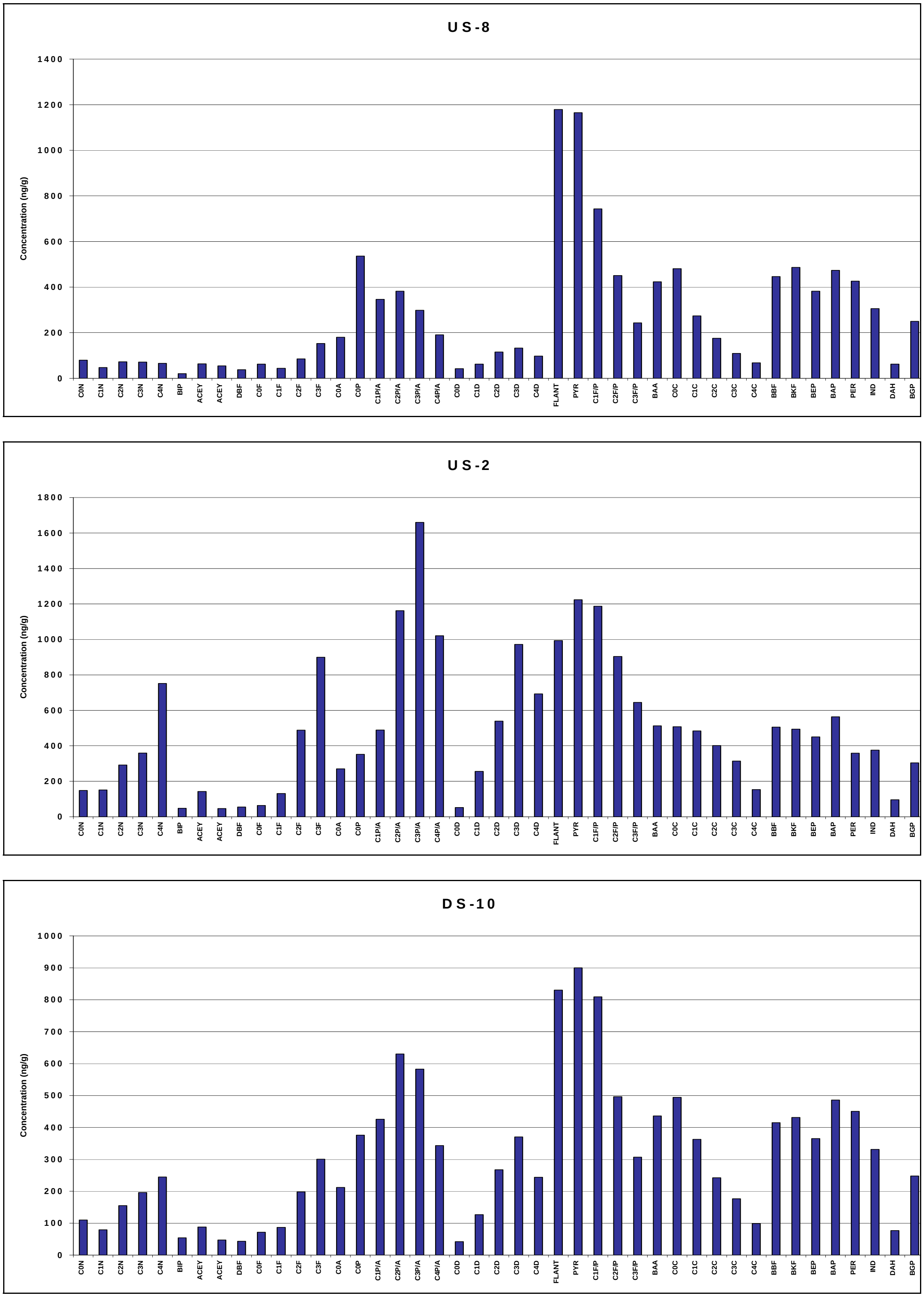


Figure 19. PAH Histograms for sediment core samples A-20, A-14, A-11, and R-1.

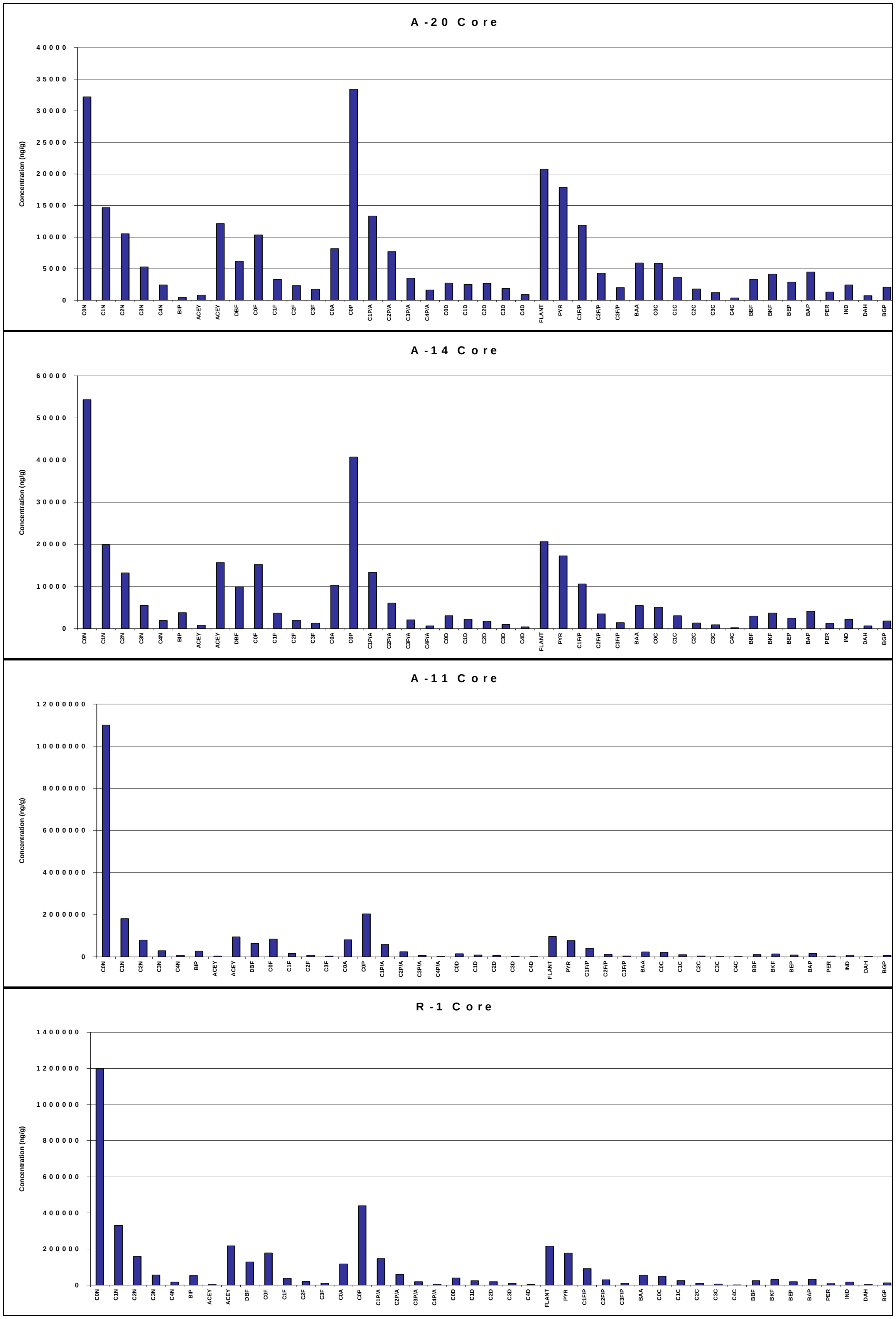


Figure 20. PAH Histograms for sediment samples A-16, A-25, and DS-3.

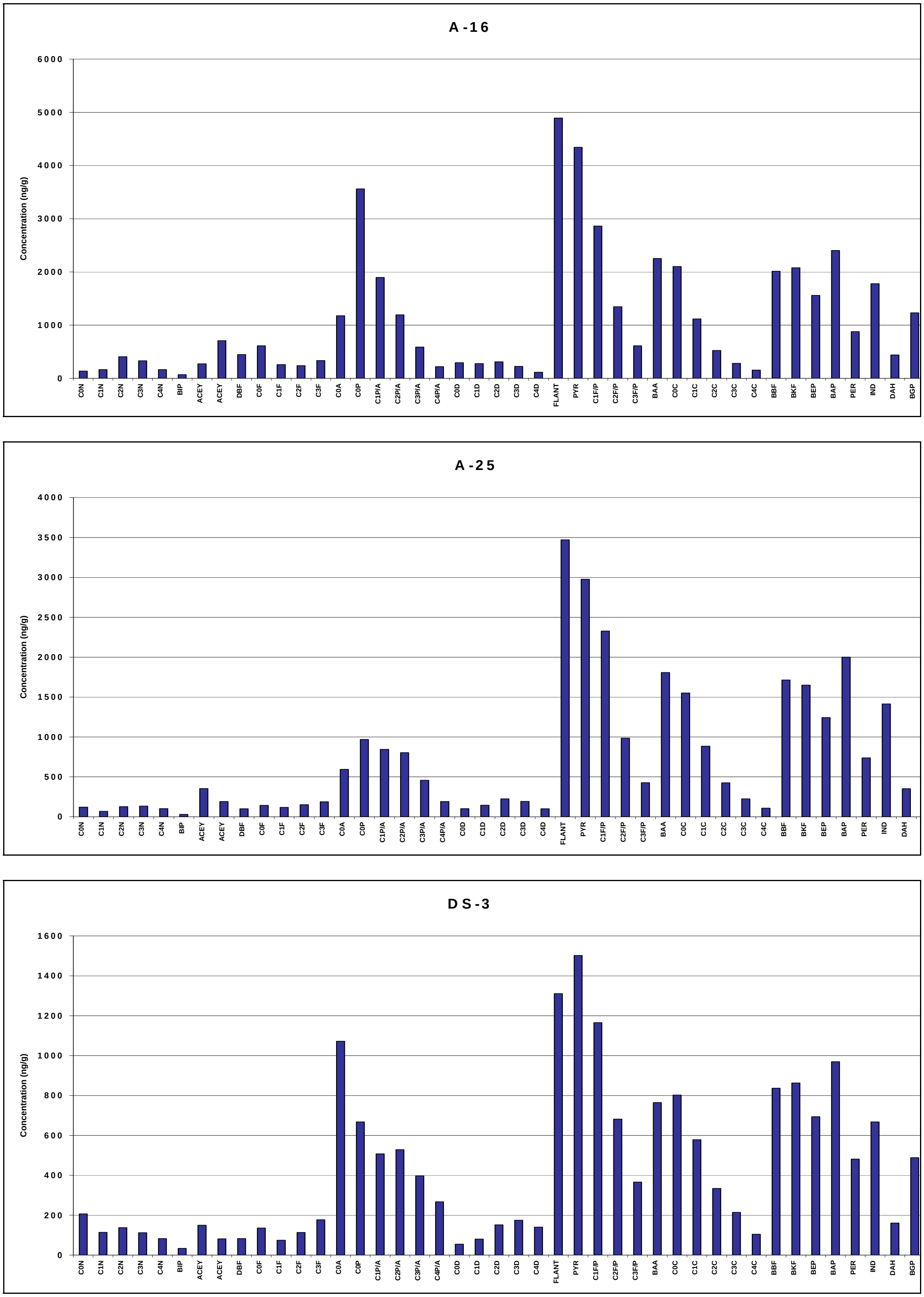
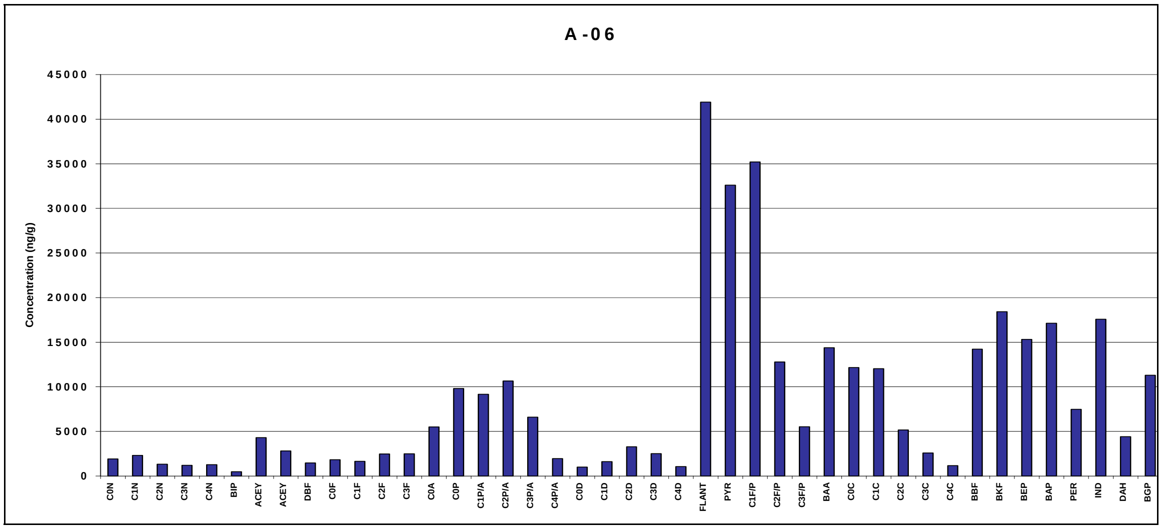
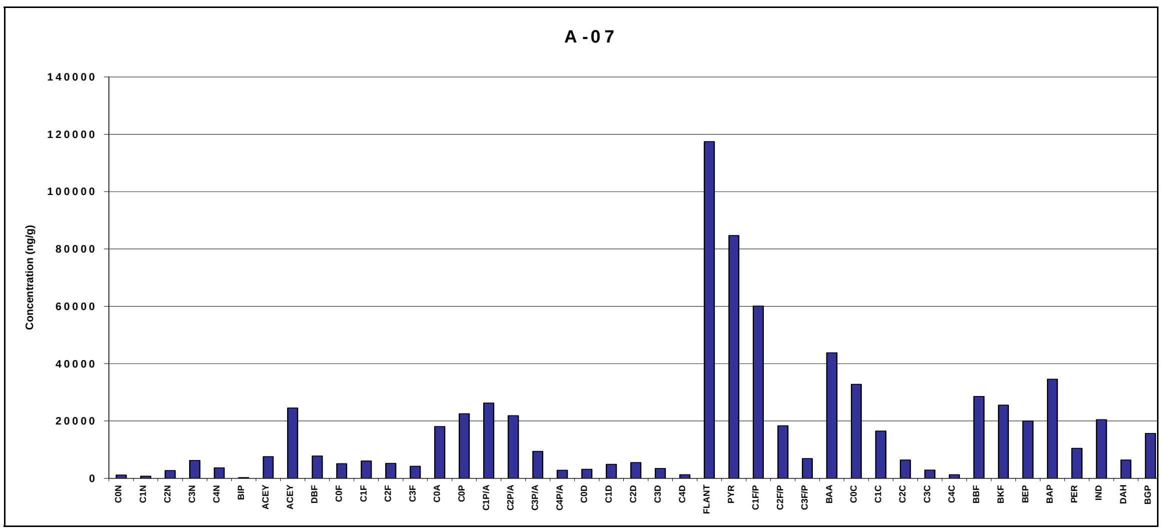


Figure 21. PAH Histograms for sediment samples A-06 and A-07, and sheen from Bulkhead-02.





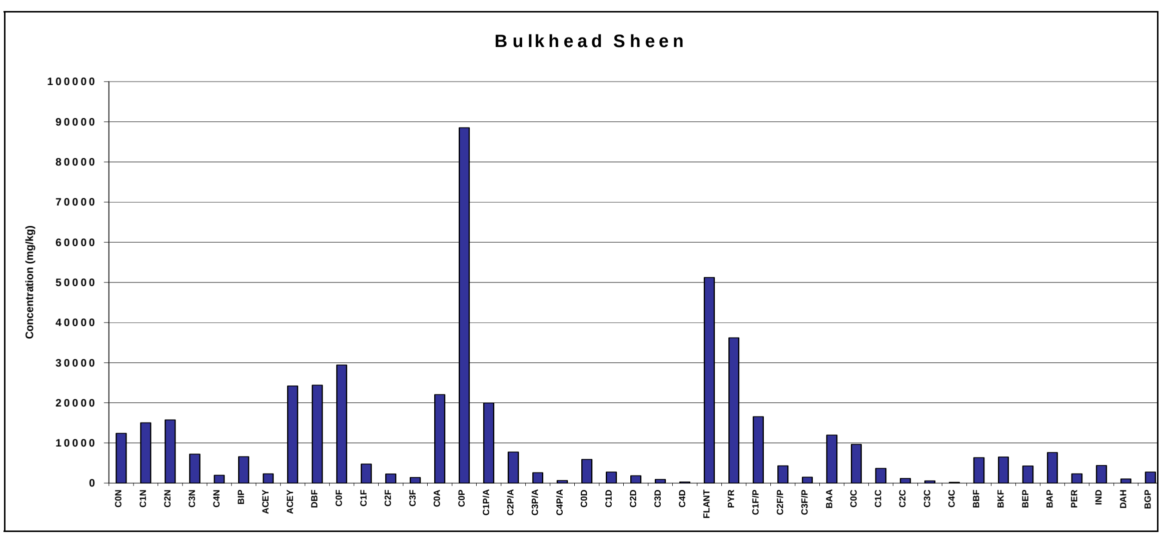
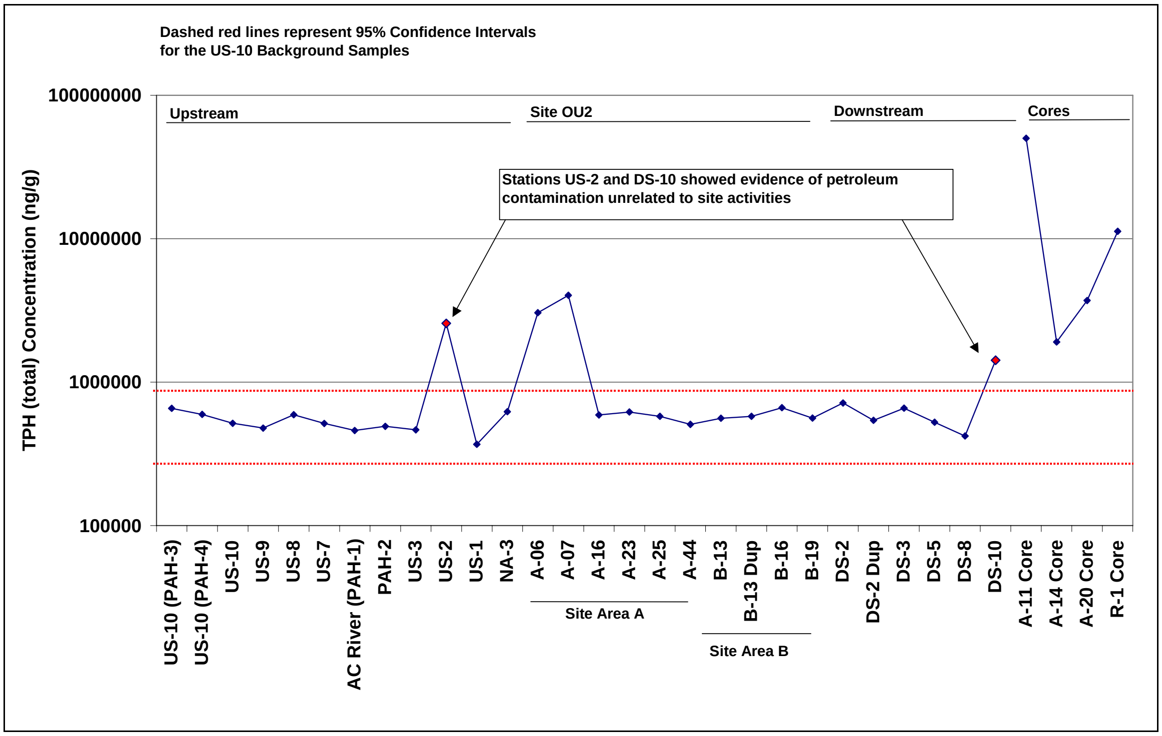


Figure 22. TPH (top) and Total PAH (bottom) concentration graphs for surface sediment and sediment core samples.



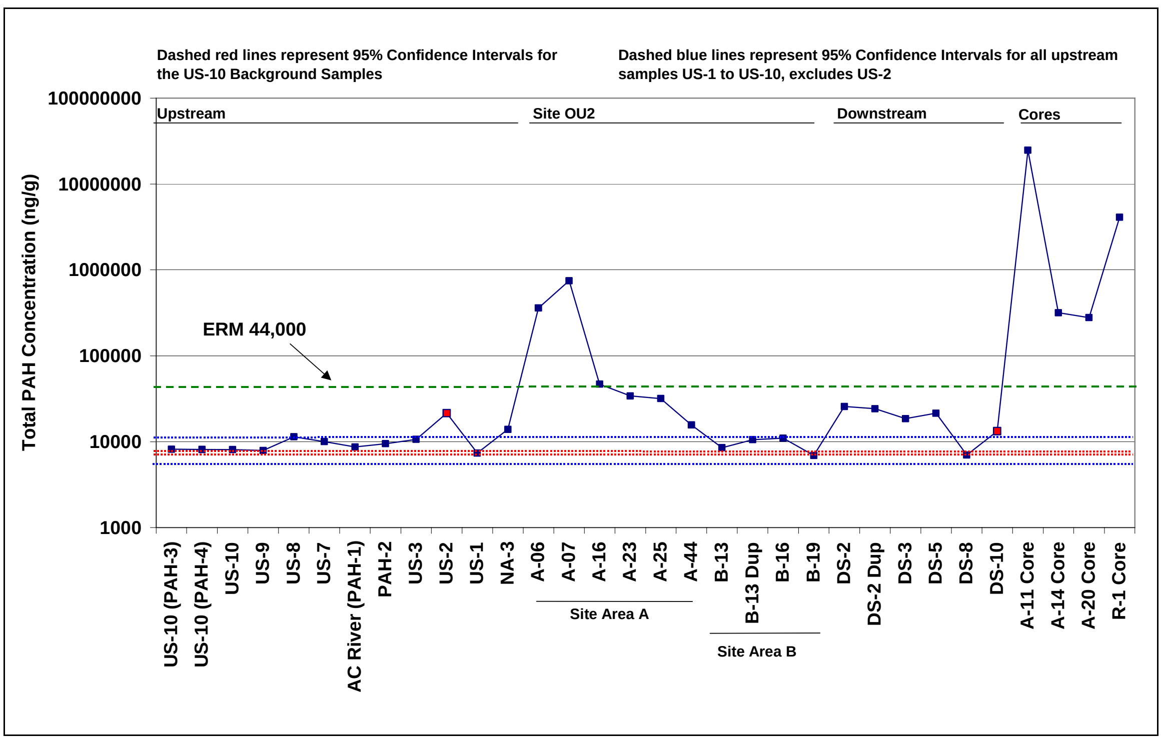
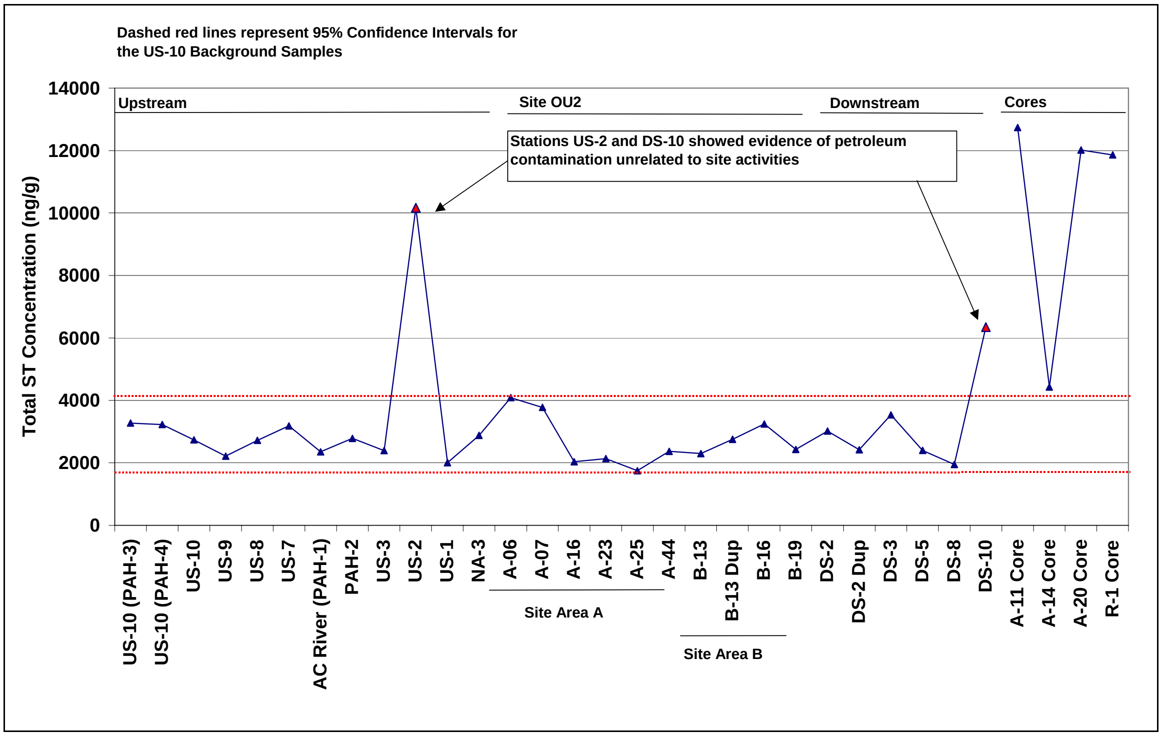


Figure 23. Total ST (top) concentration graph for surface sediment and sediment core samples and TPH-resolved/TPH (bottom) ratio graph for surface sediment, sediment core, and NAPL samples.



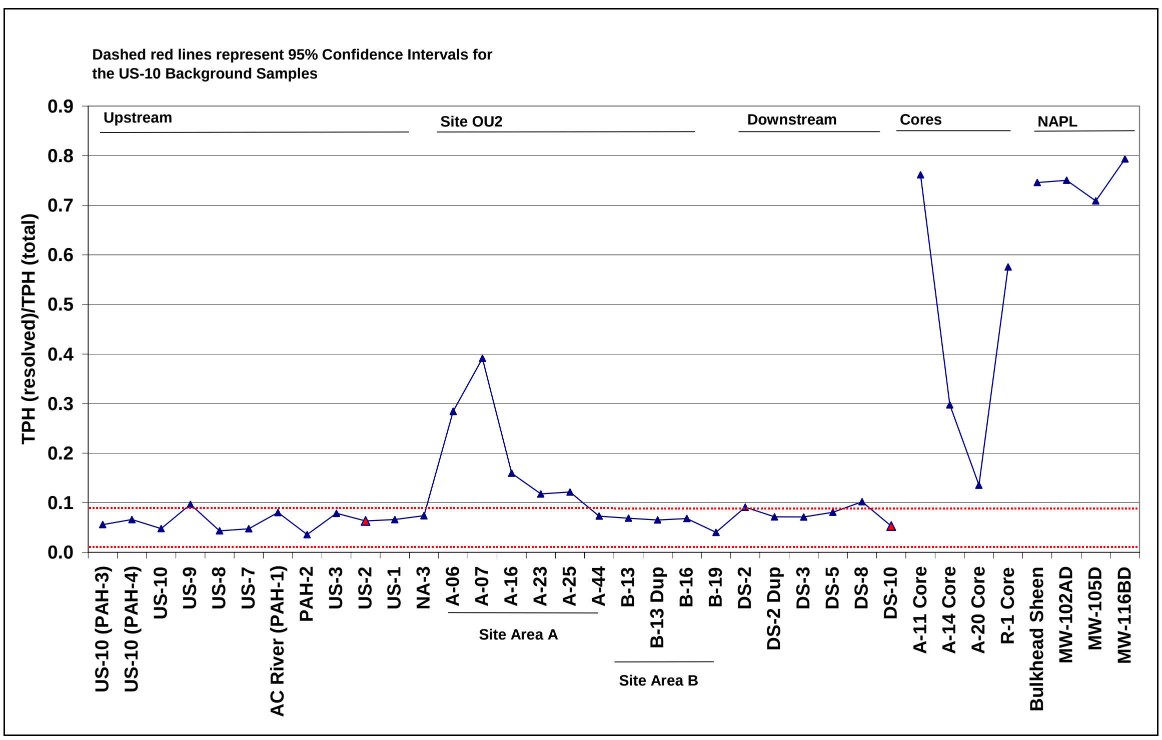


Figure 24. Double-ratio plot of Fluoranthene/Pyrene *vs.* (F+P)/(C1 to C3 F/P) for surface and core sediment and NAPL samples.

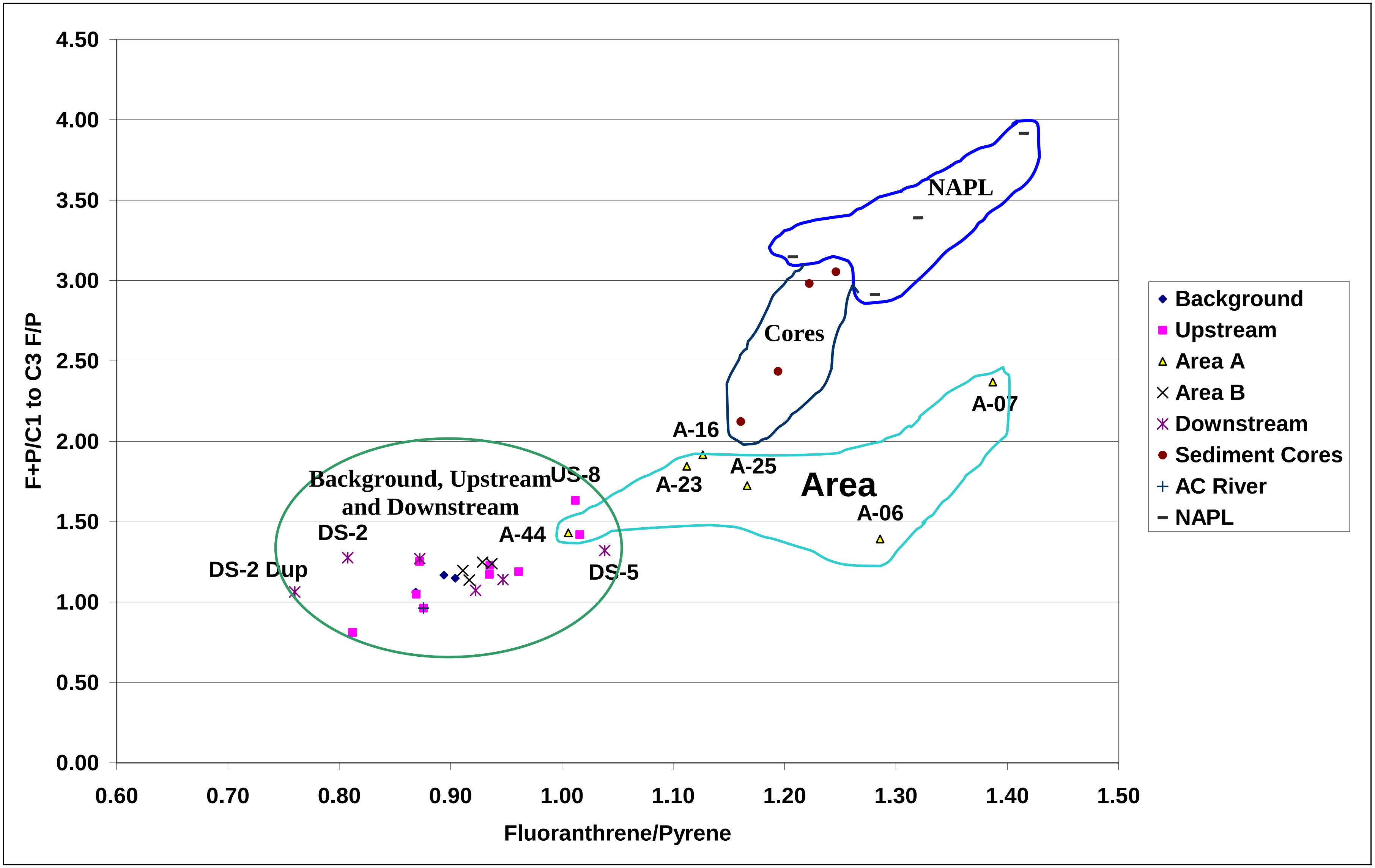


Figure 25. Principle Component Analysis (PCA) Scores Factor Plot Showing Clustering of NAPL/Sheen Samples, Core Samples (w/ A-06 and A-07), and River Sediments

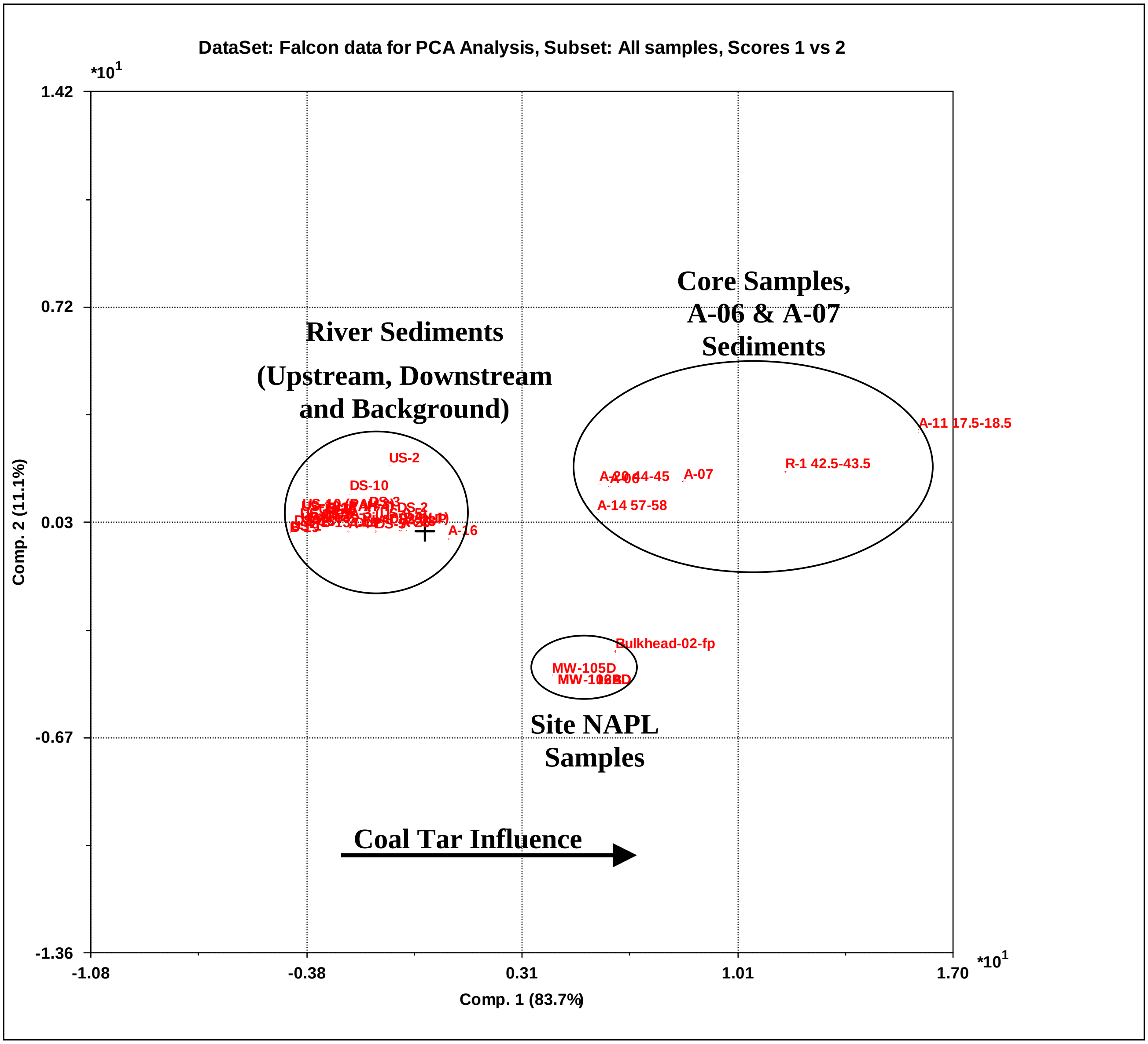
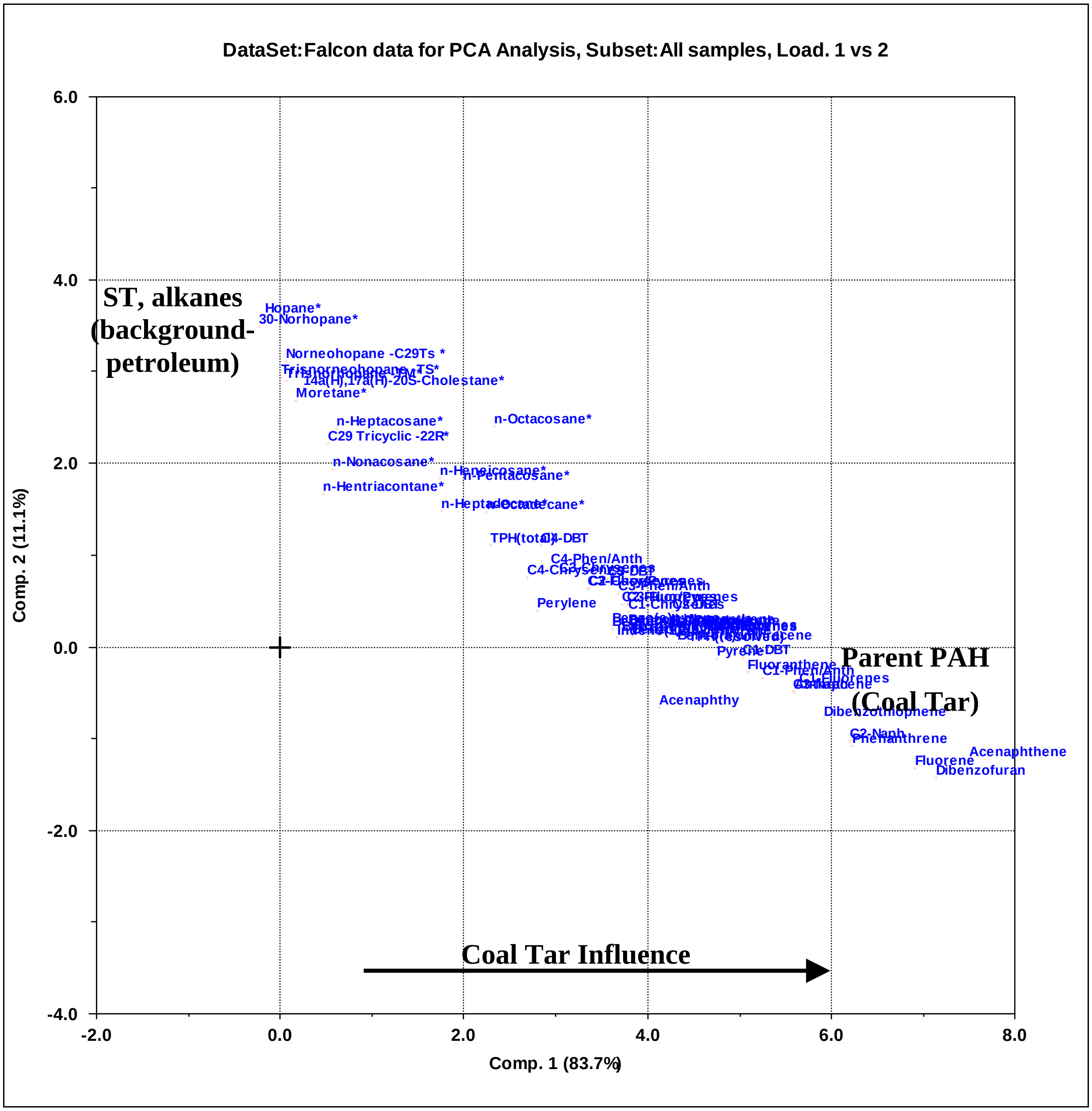


Figure 26. Principle Component Analysis (PCA) Loadings Plot



Appendix A.

PAH Data Summary Tables

Client Sample ID	SD-B16-0-0.5-111306	SD-A44-0-0.5-111306	SD-NA-3-0.0-0.5	SD-B-13-0.0-0.5
Battelle Sample ID	R4193-P	R4194-P	R4975-P	R4976-P
Sample Type	SA	SA	SA	SA
Collection Date	11/13/06	11/13/06	12/07/06	12/07/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07
Analysis Date	01/24/07	01/24/07	01/24/07	01/25/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	54.83	49.85	51.73	55.29
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.76	15.13	14.74	13.61
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	3.06	2.78	2.86	3.09
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	84.09	87.47	76.71	107.07
C1-Naphthalenes	53.34	53.5	49.98	47.39
C2-Naphthalenes	83.76	86.21	80.41	69.9
C3-Naphthalenes	72.86	77.15	71.16	56.99
C4-Naphthalenes	59.3	59.37	54.51	44.52
Biphenyl	22.02	22.38	20.4	17.77
Acenaphthylene	125.67	182.15	143.56	98.5
Acenaphthene	44.01	79.43	56.71	40.45
Dibenzofuran	37.17	55.85	47.39	34.21
Fluorene	56.96	85.9	72.56	51
C1-Fluorenes	54.53	66.7	57.58	44.2
C2-Fluorenes	79.27	82.36	78.55	59.92
C3-Fluorenes	98.4	101.89	111.18	73.69
Anthracene	215.57	311.73	278.62	160.98
Phenanthrene	324.94	517.42	446.9	273.09
C1-Phenanthrenes/Anthracenes	326.29	433.74	369.27	247.34
C2-Phenanthrenes/Anthracenes	346.99	397.72	347.68	249.47
C3-Phenanthrenes/Anthracenes	223.51	231.14	214.15	157.79
C4-Phenanthrenes/Anthracenes	111.91	102.71	98.99	78.88
Dibenzothiophene	38.67	49.49	45.25	30.05
C1-Dibenzothiophenes	65.76	73.81	65.61	48.96
C2-Dibenzothiophenes	102.37	108.84	102.24	73.93
C3-Dibenzothiophenes	102.54	98.4	96.22	71.48
C4-Dibenzothiophenes	69.27	60.3	59.82	46.84
Fluoranthene	804.77	1339.27	1154.54	620.11
Pyrene	877.88	1331.64	1136.21	667.78
C1-Fluoranthenes/Pyrenes	802.44	1066.26	889.32	573.91
C2-Fluoranthenes/Pyrenes	430.61	530.62	479.47	305.67
C3-Fluoranthenes/Pyrenes	247.18	269.46	245.09	152.47
Benzo(a)anthracene	449.3	756.24	638.61	356.75
Chrysene	337.25	767.61	739.24	385.71
C1-Chrysenes	402.64	531.69	452.68	292
C2-Chrysenes	228.84	270.04	251.74	169.04
C3-Chrysenes	182.59	225.13	194.09	122.52
C4-Chrysenes	51.54	52.91	56.3	40.17
Benzo(b)fluoranthene	470.95	732.38	665.92	351.87
Benzo(k)fluoranthene	523.09	868.34	775.41	418.31
Benzo(e)pyrene	436.6	660.16	609.62	331.71
Benzo(a)pyrene	616.9	973.6	828.95	468.44
Perylene	402.81	446.35	455.61	348.18
Indeno(1,2,3-cd)pyrene	419.99	677.6	599.51	323.64
Dibenz(a,h)anthracene	113.32	182.09	159.01	86.03
Benzo(g,h,i)perylene	392.42	606.51	550.45	303.22
Total PAH	10990.32	15713.56	13927.22	8501.95
	1.80	2.58	2.28	1.39
Surrogate Recoveries (%)				
Naphthalene-d8	64	60	66	47
Acenaphthene-d10	80	77	83	59
Phenanthrene-d10	85	80	83	63
Benzo(a)pyrene-d12	85	87	93	68

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	DUP-120706-SD2 Duplicate of B-13	SD-A-20-44-45	SD-A-14-57-58	SD-A-11-17.5-18.5
Battelle Sample ID	R4978-P	R5492-P	R5493-P	R5494-P
Sample Type	SA	SA	SA	SA
Collection Date	12/07/06	12/04/06	12/04/06	12/01/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07
Analysis Date	01/25/07	01/25/07	01/25/07	01/25/07
Analytical Instrument	MS	MS	MS	MS
% Moisture	54.64	45.29	31.65	43.85
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.81	16.61	10.31	8.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	3.05	12.67	8.17	165.31
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	142.26	32192.37	54346.08	11001642.77
C1-Naphthalenes	61.31	14675.25	19956.9	1821342.85
C2-Naphthalenes	86.19	10538.28	13218.31	795762.32
C3-Naphthalenes	69.16	5297.62	5525.59	291684.27
C4-Naphthalenes	52.76	2448.63	1921.56	75455.41
Biphenyl	23.02	461.39	3778.15	272452.17
Acenaphthylene	119.84	852.03	801.06	34618.5
Acenaphthene	49.82	12134.01	15694.49	950932.63
Dibenzofuran	44.48	6207.97	9928.07	640991.73
Fluorene	62.18	10362.18	15211.57	845838.62
C1-Fluorenes	50.81	3312.45	3685.04	162481.3
C2-Fluorenes	71.43	2348.36	1985.59	80362.69
C3-Fluorenes	89.04	1759.23	1296.09	35269.55
Anthracene	199.72	8199.86	10308.34	809292.4
Phenanthrene	337.58	33400.8	40731.08	2042231.83
C1-Phenanthrenes/Anthracenes	305.29	13348.13	13344.83	587055.37
C2-Phenanthrenes/Anthracenes	307.55	7717.66	6045	240335.18
C3-Phenanthrenes/Anthracenes	188.06	3521.73	2083.47	73584.49
C4-Phenanthrenes/Anthracenes	97	1638.38	652.48	18481.51
Dibenzothiophene	35.79	2745.35	3047.91	145869.23
C1-Dibenzothiophenes	59.23	2506.58	2228.42	88556.96
C2-Dibenzothiophenes	90.12	2687.67	1755.48	62894.41
C3-Dibenzothiophenes	84.62	1885.76	971.71	29910.98
C4-Dibenzothiophenes	54.4	934.92	410.54	9255.75
Fluoranthene	769.95	20755.09	20626.3	964706.55
Pyrene	821.72	17880.95	17271.73	774112.54
C1-Fluoranthenes/Pyrenes	702.33	11879.98	10614.95	403938.98
C2-Fluoranthenes/Pyrenes	379.21	4305.7	3509.26	119750
C3-Fluoranthenes/Pyrenes	203.74	2016.89	1436.15	45404.5
Benzo(a)anthracene	453.21	5931.32	5455.38	237272.42
Chrysene	495.19	5840.32	5085.6	215781.77
C1-Chrysenes	369.53	3647.7	3065.06	102677.85
C2-Chrysenes	211.86	1805.65	1363.62	43560.36
C3-Chrysenes	159.23	1232.88	912.05	16420.36
C4-Chrysenes	49.09	384.03	221.45	5769.97
Benzo(b)fluoranthene	447.61	3333.68	2985.38	114578.16
Benzo(k)fluoranthene	515.49	4135.63	3709.73	139968.46
Benzo(e)pyrene	413.14	2864.25	2453.98	91728.06
Benzo(a)pyrene	592.3	4485.21	4106.06	162549.01
Perylene	400.83	1332.5	1258.12	39990.81
Indeno(1,2,3-cd)pyrene	402.13	2448.49	2208.33	83325.54
Dibenz(a,h)anthracene	109.81	739.76	654.2	23478.35
Benzo(g,h,i)perylene	374.77	2078.34	1827.83	66803.46
Total PAH	10552.8	278274.98	317692.94	24768120.07
	1.73	45.63	52.09	4061.18
Surrogate Recoveries (%)				
Naphthalene-d8	64	73	59	0 DO
Acenaphthene-d10	80	71	69	0 DO
Phenanthrene-d10	83	76	64	0 DO
Benzo(a)pyrene-d12	92	81	72	0 DO

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	SD-R-1-42.5-43.5	SD-US-7-0-0.5-103006	SD-US-8-0-0.5-103006	SD-US-9-0-0.5-103006
Battelle Sample ID	R5504-P	R4042-P	R4043-P	R4044-P
Sample Type	SA	SA	SA	SA
Collection Date	12/05/06	10/30/06	10/30/06	10/30/06
Extraction Date	01/04/07	11/10/06	11/10/06	11/10/06
Analysis Date	01/25/07	11/23/06	11/23/06	11/23/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	44.03	59.28	63.36	63.78
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	8.77	12.49	11.23	11.20
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	24.01	0.84	1.87	1.03
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	1197708.26	70.94	79.62	63.97
C1-Naphthalenes	330666.01	52.62	47.46	46.16
C2-Naphthalenes	158731.19	90.11	72.71	92
C3-Naphthalenes	55839	78.14	71.04	84.58
C4-Naphthalenes	16831.3	63.72	65.78	54.41
Biphenyl	53358.1	20.4	20.79	18.17
Acenaphthylene	4831.74	109.11	63.8	66.33
Acenaphthene	217905.32	34.29	54.43	28.12
Dibenzofuran	128355.05	29.15	37.92	27.88
Fluorene	179096.75	48.5	62.46	43.55
C1-Fluorenes	37803.38	50.58	44.02	41.24
C2-Fluorenes	20039.82	82.76	85.57	68.54
C3-Fluorenes	10678.68	116.24	153.05	80.97
Anthracene	117470.96	179.25	180.41	138.34
Phenanthrene	439802.07	294.45	536.29	237.17
C1-Phenanthrenes/Anthracenes	147181.57	306.39	346.61	241.51
C2-Phenanthrenes/Anthracenes	59851.44	348.25	382.12	287.78
C3-Phenanthrenes/Anthracenes	19136.01	266.06	298.82	200.19
C4-Phenanthrenes/Anthracenes	4706.73	189.51	190.82	102.34
Dibenzothiophene	39538.17	35.7	42.53	26.42
C1-Dibenzothiophenes	24396.41	65.02	62.44	52.28
C2-Dibenzothiophenes	19660.22	123.28	115.27	84.68
C3-Dibenzothiophenes	10051.59	129.01	133.09	94.1
C4-Dibenzothiophenes	3567.22	91.77	97.45	65.75
Fluoranthene	216478.29	666.72	1179.16	573.96
Pyrene	177119.06	767.02	1165.07	613.6
C1-Fluoranthenes/Pyrenes	91432.43	706.97	743.5	507.48
C2-Fluoranthenes/Pyrenes	29717.83	423.52	450.5	295.81
C3-Fluoranthenes/Pyrenes	10866.17	236.77	243	162.75
Benzo(a)anthracene	54797.67	393.8	423.58	337.43
Chrysene	49794.33	410.39	480.97	369.17
C1-Chrysenes	25390.65	317.25	274.21	248.13
C2-Chrysenes	9582.86	197.72	175.78	133.35
C3-Chrysenes	6034.72	123.67	109.22	112.33
C4-Chrysenes	1299.37	70.83	68	43.94
Benzo(b)fluoranthene	24724.77	417.13	446	334.56
Benzo(k)fluoranthene	30508.01	426.46	486.7	348.41
Benzo(e)pyrene	19162.65	354.97	382.43	295.31
Benzo(a)pyrene	32281.1	513.62	473.55	383.29
Perylene	8433.69	417.93	426.36	388.35
Indeno(1,2,3-cd)pyrene	16535.44	363.38	305.63	249.41
Dibenz(a,h)anthracene	4952.01	86.05	62.61	55.06
Benzo(g,h,i)perylene	12583.85	275.19	249.58	202.41
Total PAH	4118901.89	10044.64	11390.35	7901.23
	675.37	1.65	1.87	1.30
Surrogate Recoveries (%)				
Naphthalene-d8	0 DO	72	71	74
Acenaphthene-d10	0 DO	78	80	79
Phenanthrene-d10	74	84	92	79
Benzo(a)pyrene-d12	82	89	76	81

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	SD-US-10-0-0.5-103006	SD-PAH-3-0-0.5-103006	SD-PAH-4-0-0.5-103006	SD-PAH-2-0-0.5-103006
		Replicate of US-10	Replicate of US-10	
Battelle Sample ID	R4045-P	R4046-P	R4047-P	R4048-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/23/06	12/03/06	12/03/06	12/03/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	58.63	58.92	60.37	52.07
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	12.64	12.36	11.91	14.47
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	0.83	1.70	1.77	0.73
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	67.71	69.43	66.14	76.34
C1-Naphthalenes	48.54	48.68	47.51	49.96
C2-Naphthalenes	73.75	71.92	72.07	77.48
C3-Naphthalenes	65.45	65.21	68.33	75.17
C4-Naphthalenes	54.32	53.03	60.77	67.58
Biphenyl	19.46	19.02	20.21	18.97
Acenaphthylene	74.23	68.81	65.13	78.15
Acenaphthene	25.58	29.14	25.37	31.76
Dibenzofuran	24.9	25.16	25.53	28.35
Fluorene	38.14	41.15	38.15	40.95
C1-Fluorenes	41.27	40.27	41.78	43.44
C2-Fluorenes	70.86	64.63	69.7	70.22
C3-Fluorenes	100.39	92.77	98.57	114.81
Anthracene	130.82	132.67	121.01	152.88
Phenanthrene	214.64	236.41	217.81	294.07
C1-Phenanthrenes/Anthracenes	256.91	242.82	237.19	268.42
C2-Phenanthrenes/Anthracenes	291.3	288.25	295.75	317.89
C3-Phenanthrenes/Anthracenes	211.98	214.49	232.02	236.81
C4-Phenanthrenes/Anthracenes	144.66	123.42	146.08	141.34
Dibenzothiophene	26.59	27.48	26.34	28.43
C1-Dibenzothiophenes	48.18	47.07	44.73	52.69
C2-Dibenzothiophenes	94.99	90.63	88.31	99.7
C3-Dibenzothiophenes	103.92	99.97	107.09	121.02
C4-Dibenzothiophenes	80.31	76.38	76.44	85.63
Fluoranthene	531.64	584.3	551.39	703.32
Pyrene	612	653.51	609.81	806.42
C1-Fluoranthenes/Pyrenes	545.35	542.56	519.14	612.8
C2-Fluoranthenes/Pyrenes	334.01	330.04	314.36	380.03
C3-Fluoranthenes/Pyrenes	197.46	187.49	177.65	212.28
Benzo(a)anthracene	317.83	341.26	333.49	391.68
Chrysene	331.74	364.37	356.25	413.61
C1-Chrysenes	274.66	268.92	266.49	293.85
C2-Chrysenes	172.56	174.28	178.16	182.36
C3-Chrysenes	116.85	112.06	122.25	119.41
C4-Chrysenes	59.93	63.51	69.38	70.66
Benzo(b)fluoranthene	343.44	346.86	349.3	415.16
Benzo(k)fluoranthene	344.54	376.62	371.97	441.99
Benzo(e)pyrene	298.9	317.75	309.18	354.92
Benzo(a)pyrene	385.74	389.02	381.7	483.67
Perylene	390.55	364.59	435.21	342.41
Indeno(1,2,3-cd)pyrene	264.77	255.14	248.93	346.4
Dibenz(a,h)anthracene	61.67	56.25	51.79	82.16
Benzo(g,h,i)perylene	200.07	196.11	178.51	264.6
Total PAH	8092.61	8193.45	8116.99	9489.79
	1.33	1.34	1.33	1.56
Surrogate Recoveries (%)				
Naphthalene-d8	71	66	67	65
Acenaphthene-d10	75	71	71	71
Phenanthrene-d10	76	72	70	73
Benzo(a)pyrene-d12	77	68	72	76

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	SD-US-2-0-0.5-103006	SD-A-16-0-0.5-103006	SD-US-3-0-0.5-103006	SD-US-1-0-0.5-103006
Battelle Sample ID	R4049-P	R4050-P	R4051-P	R4052-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/24/06	11/24/06	12/03/06	12/03/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	50.12	50.32	54.26	55.25
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	15.21	15.18	13.92	13.85
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	2.77	1.39	0.76	0.76
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	148.65	134.45	81.8	57.42
C1-Naphthalenes	151	165.58	53.96	40.1
C2-Naphthalenes	292.09	406.62	85.75	59.39
C3-Naphthalenes	359.36	328.43	83.55	55.12
C4-Naphthalenes	751.65	165.54	69.22	47.17
Biphenyl	48.24	69.57	19.76	15.14
Acenaphthylene	143.14	273.08	98.08	62.9
Acenaphthene	46.39	706.4	37.61	25.83
Dibenzofuran	55.1	448.36	32.13	23.63
Fluorene	63.87	613.22	48.71	35.07
C1-Fluorenes	130.83	258.59	53.81	33.73
C2-Fluorenes	489.01	239.88	87.14	56.73
C3-Fluorenes	900.18	333.51	121.88	87.61
Anthracene	270.48	1177.41	195.31	123.81
Phenanthrene	352.39	3562.7	316.82	223.15
C1-Phenanthrenes/Anthracenes	489.46	1896.36	325.93	222.6
C2-Phenanthrenes/Anthracenes	1161.88	1194.11	362.7	268.42
C3-Phenanthrenes/Anthracenes	1660.42	588.98	264.29	186.53
C4-Phenanthrenes/Anthracenes	1020.98	220.81	144.65	105.05
Dibenzothiophene	52.46	293.51	32.84	24.3
C1-Dibenzothiophenes	255.7	278.56	58.18	40.82
C2-Dibenzothiophenes	539.3	311.29	117.97	81.19
C3-Dibenzothiophenes	972.54	223.34	127.14	87.45
C4-Dibenzothiophenes	692.79	113.7	82.12	61.05
Fluoranthene	993.95	4892.58	781.43	538.23
Pyrene	1224.14	4342.78	813.01	575.72
C1-Fluoranthenes/Pyrenes	1187.51	2861.81	710.43	488.46
C2-Fluoranthenes/Pyrenes	904.1	1345.1	412.59	293.32
C3-Fluoranthenes/Pyrenes	644.53	611.9	217.64	168.99
Benzo(a)anthracene	512.59	2253.48	467.43	315.36
Chrysene	507.75	2101.75	509.58	323.58
C1-Chrysenes	484.16	1116.02	348.98	234.23
C2-Chrysenes	401.44	524.83	206.36	145.82
C3-Chrysenes	314.2	282.09	134.96	95.29
C4-Chrysenes	153.24	155.17	70.7	51.3
Benzo(b)fluoranthene	506.03	2013.01	464.67	315.55
Benzo(k)fluoranthene	493.86	2078.71	483.62	335.11
Benzo(e)pyrene	450.16	1559.56	392.1	272.85
Benzo(a)pyrene	563.5	2403.73	557.94	373.5
Perylene	358.96	878.77	410.3	307.88
Indeno(1,2,3-cd)pyrene	375.76	1778.28	384.23	264.71
Dibenz(a,h)anthracene	95.86	440.06	91.27	61.99
Benzo(g,h,i)perylene	304.09	1231.12	288.31	199.32
Total PAH	21523.74	46874.75	10646.9	7385.42
	3.53	7.69	1.75	1.21
Surrogate Recoveries (%)				
Naphthalene-d8	68	60	75	70
Acenaphthene-d10	72	67	79	72
Phenanthrene-d10	697	66	80	74
Benzo(a)pyrene-d12	66	75	86	79

DO - Diluted Out

& - Value exceeds acceptance criteria

Client Sample ID	SD-US-8-0-0.5-103106	SD-DS-5-0-0.5-103106	SD-DS-10-0-0.5-103106	SD-PAH-1-0-0.5-103106
Battelle Sample ID	R4053-P	R4054-P	R4055-P	R4056-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/31/06	10/31/06	10/31/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/24/06	11/24/06	12/03/06	11/24/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	59.88	51.48	58.68	62.9
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	12.12	14.63	12.62	11.33
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	0.87	0.72	1.67	0.93
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	60.42	116.59	110.05	83.94
C1-Naphthalenes	42.44	76.16	79.05	57.48
C2-Naphthalenes	67.69	130.75	154.8	94.61
C3-Naphthalenes	64	127.3	196.25	76.54
C4-Naphthalenes	55.4	121.37	244.56	60.62
Biphenyl	16.73	25.36	54.36	20.66
Acenaphthylene	71.72	164.96	87.83	122.25
Acenaphthene	26.83	125.49	47.36	37.77
Dibenzofuran	28.12	85.09	43.28	32.58
Fluorene	41.71	131.19	71.85	46.16
C1-Fluorenes	35.98	79.4	86.73	48.2
C2-Fluorenes	66.9	141.91	198.12	72.96
C3-Fluorenes	106.48	209.62	300.59	104.92
Anthracene	135.41	489.95	211.91	227.6
Phenanthrene	216.37	1123.93	375.88	250.42
C1-Phenanthrenes/Anthracenes	204.6	691.32	425.68	268.42
C2-Phenanthrenes/Anthracenes	249.46	629.92	630.12	307.89
C3-Phenanthrenes/Anthracenes	180.67	421.98	582.68	224.84
C4-Phenanthrenes/Anthracenes	103.74	222.98	343.29	134.93
Dibenzothiophene	24.12	83.68	42.46	31.54
C1-Dibenzothiophenes	43.44	111.38	126.66	53.56
C2-Dibenzothiophenes	77.62	163.26	267.5	102.83
C3-Dibenzothiophenes	92.81	156.03	370.17	111.54
C4-Dibenzothiophenes	58.9	117.15	243.85	78.87
Fluoranthene	474.39	1808.83	830.42	528.43
Pyrene	500.91	1741.86	900.17	603.48
C1-Fluoranthenes/Pyrenes	430.54	1390.63	809.05	612.9
C2-Fluoranthenes/Pyrenes	265.02	844.81	496.37	366.67
C3-Fluoranthenes/Pyrenes	160.04	451.48	307.15	197.42
Benzo(a)anthracene	267.38	1028.54	436	341.59
Chrysene	308.34	1023.23	494.2	361.37
C1-Chrysenes	202.88	647.36	362.88	282.89
C2-Chrysenes	132.44	342.07	242.14	178.3
C3-Chrysenes	82.76	206.55	176.45	116.97
C4-Chrysenes	46.42	109.77	99.07	60.64
Benzo(b)fluoranthene	287.44	1018.61	415.06	333.97
Benzo(k)fluoranthene	286.19	1002.85	431.35	364.17
Benzo(e)pyrene	239.71	793.4	365.08	300.42
Benzo(a)pyrene	332.27	1191.69	485.58	438.95
Perylene	425.04	509.12	450.48	334.29
Indeno(1,2,3-cd)pyrene	247.9	849.11	331.08	304.44
Dibenz(a,h)anthracene	58.19	217.35	76.63	74.59
Benzo(g,h,i)perylene	186.2	605.69	248.14	229
Total PAH	7005.62	21529.72	13252.33	8681.62
	1.15	3.53	2.17	1.42
Surrogate Recoveries (%)				
Naphthalene-d8	61	66	69	75
Acenaphthene-d10	66	72	71	81
Phenanthrene-d10	69	73	76	85
Benzo(a)pyrene-d12	77	80	76	94

DO - Diluted Out

& - Value exceeds acceptance criteria

Client Sample ID	SD-DS-2-0-0.5-103106	DUP-103106	SD-DS-3-0-0.5-103106	SD-B-19-0-0.5-102406
Battelle Sample ID	R4057-P	R4058-P	R4059-P	R3943-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/31/06	10/31/06	10/24/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/06/06
Analysis Date	11/24/06	11/24/06	12/03/06	11/23/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	52.36	55.75	57.3	54.56
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	14.53	13.66	13.22	13.66
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	1.45	0.77	1.59	1.54
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	348.59	315.45	206.79	54.29
C1-Naphthalenes	164.32	142.92	113.93	39.97
C2-Naphthalenes	198.68	180.6	137.79	73.62
C3-Naphthalenes	169.44	153.2	112.33	67.99
C4-Naphthalenes	126	115.32	82.45	58.05
Biphenyl	43.87	38.15	33.31	16.87
Acenaphthylene	282.8	272.03	149.98	59.95
Acenaphthene	150.91	144.73	81.39	25.13
Dibenzofuran	122.26	110.36	83.07	25.2
Fluorene	153.05	134.77	135.81	39.38
C1-Fluorenes	131.12	122.93	74.46	39.54
C2-Fluorenes	174.09	163.71	113.48	70.42
C3-Fluorenes	199.13	191.19	177.27	98.51
Anthracene	620.09	539.06	1071.86	135.22
Phenanthrene	973.42	807.82	667.65	206.99
C1-Phenanthrenes/Anthracenes	840.77	750.53	507.86	237.13
C2-Phenanthrenes/Anthracenes	787.36	790.09	528.56	293.61
C3-Phenanthrenes/Anthracenes	510.23	537.72	397.33	195.96
C4-Phenanthrenes/Anthracenes	274.89	276.08	267.07	108.35
Dibenzothiophene	89.49	77.27	54.53	24
C1-Dibenzothiophenes	138.15	121.05	80.1	46.21
C2-Dibenzothiophenes	216.05	199.96	152.1	85.29
C3-Dibenzothiophenes	184.97	199.35	175.07	94.55
C4-Dibenzothiophenes	145.87	132.68	140.16	65.01
Fluoranthene	1875.01	1560.89	1310.24	526.15
Pyrene	2321.48	2053.56	1501.93	577.54
C1-Fluoranthenes/Pyrenes	1900.63	1959.44	1165.14	488.61
C2-Fluoranthenes/Pyrenes	926.59	960.78	681.82	278.72
C3-Fluoranthenes/Pyrenes	460.75	480.09	365.81	155.98
Benzo(a)anthracene	1103.45	1007.89	764.96	271.41
Chrysene	1093.82	1040.37	802.31	292.75
C1-Chrysenes	806.57	798.31	578.67	210.75
C2-Chrysenes	420.98	418.93	334.26	128.97
C3-Chrysenes	244.45	215.75	214.25	77.81
C4-Chrysenes	115.95	105.48	104.72	42.87
Benzo(b)fluoranthene	1184.91	1100.23	836.92	275.82
Benzo(k)fluoranthene	1141.26	1139.59	863.08	278.09
Benzo(e)pyrene	927.23	891	694.28	240.01
Benzo(a)pyrene	1490.84	1441.96	969.42	289.17
Perylene	643.09	581.06	481.49	283.75
Indeno(1,2,3-cd)pyrene	1039.85	1014.45	667.55	183.54
Dibenz(a,h)anthracene	259.73	258.33	160.32	42.62
Benzo(g,h,i)perylene	745.99	711.42	488.51	129.34
Total PAH	25748.13	24256.5	18530.03	6935.14
	4.22	3.98	3.04	1.14
Surrogate Recoveries (%)				
Naphthalene-d8	66	61	77	63
Acenaphthene-d10	72	67	81	69
Phenanthrene-d10	72	68	83	73
Benzo(a)pyrene-d12	79	75	84	59

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	SD-A-06-0-0.5-102406	SD-A-07-0-0.5-102406	SD-A-23-0-0.5-102406	SD-A-25-0-0.5-102406
Battelle Sample ID	R3952-P	R3953-P	R3955-P	R3956-P
Sample Type	SA	SA	SA	SA
Collection Date	10/24/06	10/24/06	10/24/06	10/24/06
Extraction Date	11/06/06	11/06/06	11/06/06	11/06/06
Analysis Date	12/03/06	11/23/06	11/23/06	11/23/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	57.19	56.21	55.9	49.64
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	6.52	6.63	13.39	15.10
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	6.46	6.35	1.57	1.39
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
Naphthalene	1913.58	1198.87	103.32	120.59
C1-Naphthalenes	2304.87	775.41	60.44	68.17
C2-Naphthalenes	1327.71	2741.48	107.25	127.66
C3-Naphthalenes	1203.63	6266.52	119.11	133.44
C4-Naphthalenes	1270.12	3676.19	104.78	102.12
Biphenyl	476.81	245.77	23.87	29.68
Acenaphthylene	4316.16	7561.98	294.99	354.12
Acenaphthene	2810.98	24569.15	137.3	190.59
Dibenzofuran	1460.47	7802.03	80.24	99.39
Fluorene	1818.06	5128.72	167.96	143.24
C1-Fluorenes	1654.24	6078.32	186.68	117.06
C2-Fluorenes	2477.63	5261.23	211.16	151.23
C3-Fluorenes	2483.56	4249.1	216.89	188.08
Anthracene	5508.7	18065.23	893.74	594.58
Phenanthrene	9813.6	22567.31	2302.31	970.08
C1-Phenanthrenes/Anthracenes	9160.63	26262.15	1453.86	844.76
C2-Phenanthrenes/Anthracenes	10665.37	21859.63	1014.04	803.85
C3-Phenanthrenes/Anthracenes	6601.17	9449.26	518.82	457.4
C4-Phenanthrenes/Anthracenes	1952.74	2838.02	212.94	191.7
Dibenzothiophene	1001.89	3203.77	185.01	101.91
C1-Dibenzothiophenes	1622.22	4918.26	223.12	145
C2-Dibenzothiophenes	3272.1	5532.18	273.84	224.45
C3-Dibenzothiophenes	2510.43	3428.77	208.59	192.3
C4-Dibenzothiophenes	1062.28	1247.2	110.71	99.68
Fluoranthene	41927.65	117477.54	3799.05	3471.62
Pyrene	32608.03	84698.28	3415.92	2976.41
C1-Fluoranthenes/Pyrenes	35203.27	60103.11	2449.62	2326.96
C2-Fluoranthenes/Pyrenes	12791	18333.03	990.14	986.04
C3-Fluoranthenes/Pyrenes	5524.93	6919.5	471.72	428.18
Benzo(a)anthracene	14392.08	43819.32	1740.1	1807.99
Chrysene	12164.7	32796.61	1479.89	1550.9
C1-Chrysenes	12045.05	16492.16	835.11	884.05
C2-Chrysenes	5159.13	6405.13	412.7	425.68
C3-Chrysenes	2570.95	2872.64	220.73	224.83
C4-Chrysenes	1168.61	1262.97	103.85	107.5
Benzo(b)fluoranthene	14220.64	28566.33	1537.21	1714.26
Benzo(k)fluoranthene	18424.22	25547.82	1504.36	1649.7
Benzo(e)pyrene	15323.04	20043.09	1141.56	1244.45
Benzo(a)pyrene	17125.92	34627.57	1790.65	2001.06
Perylene	7485.05	10496.4	671.93	737.43
Indeno(1,2,3-cd)pyrene	17586.42	20440.22	1222.54	1413.87
Dibenz(a,h)anthracene	4423.55	6420.37	299.71	352.41
Benzo(g,h,i)perylene	11293.96	15664.5	820.96	970.56
Total PAH	360127.15	747913.14	34118.72	31724.98
	59.05	122.63	5.59	5.20
Surrogate Recoveries (%)				
Naphthalene-d8	73	73	58	62
Acenaphthene-d10	79	82	63	68
Phenanthrene-d10	79	83	66	69
Benzo(a)pyrene-d12	86	83	68	79

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	MW-116BD-101606	MW-105D-101606	Bulkhead-02-fp	MW-102AD-102606
Battelle Sample ID	R3836-P	R3837-P	R3959-P	R3960-P
Sample Type	SA	SA	SA	SA
Collection Date	10/16/06	10/16/06	10/24/06	10/26/06
Extraction Date	11/22/06	11/22/06	11/22/06	11/22/06
Analysis Date	11/27/06	11/28/06	11/27/06	11/28/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	NA	NA	NA	NA
% Lipid	NA	NA	NA	NA
Matrix	NAPL	NAPL	FILTER	NAPL
Sample Size	130.00	145.00	77.00	148.00
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL	MG_OIL
Reporting Limit	1.25	1.12	2.11	1.10
Units	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL
Naphthalene	125510.49	55953.46	12384.85	132711.01
C1-Naphthalenes	25550.58	15683.63	15044.78	26280.42
C2-Naphthalenes	15240.19	7627.47	15740.13	13054.44
C3-Naphthalenes	5519.12	2502.3	7219.34	4588.65
C4-Naphthalenes	1476.62	616.45	1932.67	1291.02
Biphenyl	4611.88	3421.23	6594.54	5042.6
Acenaphthylene	2151.07	1783.22	2305.64	4612.52
Acenaphthene	14206.58	11796.85	24188.64	10406.92
Dibenzofuran	10763.27	10628.11	24365.3	11310.13
Fluorene	12340.05	12038.98	29395.41	11952.62
C1-Fluorenes	2613.42	1790.2	4745.41	2461.56
C2-Fluorenes	1407.31	860.74	2267.97	1473.54
C3-Fluorenes	752.39	569.5	1413.49	881.08
Anthracene	7818.71	7325.78	22059.58	8657.97
Phenanthrene	36217.05	35210.99	88507.49	35101.27
C1-Phenanthrenes/Anthracenes	10035.79	7773.29	19945.47	9597.78
C2-Phenanthrenes/Anthracenes	4018.63	3148.11	7718.44	4206.64
C3-Phenanthrenes/Anthracenes	1242.7	1145.63	2587.42	1494.53
C4-Phenanthrenes/Anthracenes	342.44	324.31	633.32	410.07
Dibenzothiophene	2613.38	2452.07	5863.3	2358.65
C1-Dibenzothiophenes	1604.67	1384.83	2728.81	1295.2
C2-Dibenzothiophenes	1008.42	1009.48	1816.14	916.24
C3-Dibenzothiophenes	471.6	527.47	909.34	499.18
C4-Dibenzothiophenes	124.49	176.77	262.55	164.75
Fluoranthene	15844.18	19934.82	51221.24	16657.39
Pyrene	12368.17	15103.41	36201.11	13797.41
C1-Fluoranthenes/Pyrenes	6858.44	7453.69	16553.54	6711.17
C2-Fluoranthenes/Pyrenes	2046.34	2100.6	4279.79	2107.66
C3-Fluoranthenes/Pyrenes	777.8	782.33	1485.91	857.66
Benzo(a)anthracene	4030.85	5058.21	11970.38	4240.05
Chrysene	3646.03	4004.18	9649.15	3540.52
C1-Chrysenes	1860.08	1960.41	3656.66	1818.77
C2-Chrysenes	684.91	722.9	1167.05	743.74
C3-Chrysenes	302.11	390	548.07	361.24
C4-Chrysenes	135.08	153.25	205.35	144.74
Benzo(b)fluoranthene	2784.19	3602.17	6352.42	2696
Benzo(k)fluoranthene	2798.58	3691.57	6478.74	2670.37
Benzo(e)pyrene	2131.77	2670.92	4264.44	2126.36
Benzo(a)pyrene	3508.52	4745.35	7600.45	3727.77
Perylene	1018.93	1514.8	2290.78	1142.22
Indeno(1,2,3-cd)pyrene	2235.21	3292.66	4360.84	2410.52
Dibenz(a,h)anthracene	561.39	739.11	1033.07	526.9
Benzo(g,h,i)perylene	1602.55	2190.07	2763.83	1735.38
Total PAH	352835.98	265861.32	472712.85	358784.66
	57.85	43.59	77.51	58.83
Surrogate Recoveries (%)				
Naphthalene-d8	113	111	101	113
Acenaphthene-d10	135 &	124 &	142 &	134 &
Phenanthrene-d10	90	91	101	90
Benzo(a)pyrene-d12	105	111	99	110

DO - Diluted Out
& - Value exceeds acceptance criteria

Client Sample ID	Bulkhead Blank		EB-120606-SD	
Battelle Sample ID	R3958-P		R4979-P	
Sample Type	SA		SA	
Collection Date	10/24/06		12/06/06	
Extraction Date	11/22/06		12/13/06	
Analysis Date	11/27/06		12/20/06	
Analytical Instrument	MS		MS	
% Moisture	NA		NA	
% Lipid	NA		NA	
Matrix	FILTER		EQUIPMENT BLANK	
Sample Size	0.00		0.97	
Size Unit-Basis	MG_OIL		L_LIQUID	
Reporting Limit	162.50		5.15	
Units	NG_OIL		NG/L_LIQUID	
Naphthalene	81.16	J	41.68	
C1-Naphthalenes		U	19.95	
C2-Naphthalenes		U	29.82	
C3-Naphthalenes		U	21.55	
C4-Naphthalenes		U	10.89	
Biphenyl		U	7.34	
Acenaphthylene		U	30.23	
Acenaphthene		U	38	
Dibenzofuran		U	17.34	
Fluorene	20	J	31.28	
C1-Fluorenes		U	16.99	
C2-Fluorenes		U		U
C3-Fluorenes		U		U
Anthracene		U	80.29	
Phenanthrene	30.91	J	391.5	
C1-Phenanthrenes/Anthracenes		U	337.96	
C2-Phenanthrenes/Anthracenes		U	136.4	
C3-Phenanthrenes/Anthracenes		U	1.38	J
C4-Phenanthrenes/Anthracenes		U		U
Dibenzothiophene		U	20.68	
C1-Dibenzothiophenes		U	31.47	
C2-Dibenzothiophenes		U	30.26	
C3-Dibenzothiophenes		U		U
C4-Dibenzothiophenes		U		U
Fluoranthene	21.1	J	808.02	
Pyrene	16.85	J	719.12	
C1-Fluoranthenes/Pyrenes		U	286.53	
C2-Fluoranthenes/Pyrenes		U	217.1	
C3-Fluoranthenes/Pyrenes		U		U
Benzo(a)anthracene		U	313.46	
Chrysene		U	362.56	
C1-Chrysenes		U	128.24	
C2-Chrysenes		U		U
C3-Chrysenes		U		U
C4-Chrysenes		U		U
Benzo(b)fluoranthene		U	325.64	
Benzo(k)fluoranthene		U	352.82	
Benzo(e)pyrene		U	267.23	
Benzo(a)pyrene		U	357.7	
Perylene		U	103.75	
Indeno(1,2,3-cd)pyrene		U	257.97	
Dibenz(a,h)anthracene		U	55.87	
Benzo(g,h,i)perylene		U	247.73	
Total PAH	170.02	J	6098.75	

Surrogate Recoveries (%)

Naphthalene-d8	113	79
Acenaphthene-d10	101	84
Phenanthrene-d10	97	90
Benzo(a)pyrene-d12	96	93

DO - Diluted Out
& - Value exceeds acceptance criteria

Appendix B.

Biomarker Data Summary Tables

Client Sample ID	SD-B16-0-0.5-111306	SD-A44-0-0.5-111306	SD-NA-3-0.0-0.5	SD-B-13-0.0-0.5	DUP-120706-SD2 Replicate of B-13
Battelle Sample ID	R4193-P	R4194-P	R4975-P	R4976-P	R4978-P
Sample Type	SA	SA	SA	SA	SA
Collection Date	11/13/06	11/13/06	12/07/06	12/07/06	12/07/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07	01/04/07
Analysis Date	01/24/07	01/24/07	01/24/07	01/25/07	01/25/07
Analytical Instrument	MS	MS	MS	MS	MS
% Moisture	54.83	49.85	51.73	55.29	54.64
% Lipid	NA	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.76	15.13	14.74	13.61	13.81
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	6.12	5.57	5.71	6.19	6.10
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	54.3	40.69	42.92	38.04	45.13
C24 Tricyclic Terpane	34.01	23.22	26.76	22.39	28.81
C25 Tricyclic Terpane	48.13	32.2	37.24	32.48	36.84
C24 Tetracyclic Terpane	32.01	23.28	26.95	21.84	26.9
C26 Tricyclic Terpane -22S	15.2	10.81	12.9	11.58	12.65
C26 Tricyclic Terpane -22R	14.35	9.77	11.95	10.46	11.79
C28 Tricyclic Terpane -22S	14.54	9.75	12.53	9.46	12.35
C28 Tricyclic Terpane -22R	15.94	11.53	13.32	11.64	13.96
C29 Tricyclic Terpane -22S	19.3	12.1	14.01	12.37	15.09
C29 Tricyclic Terpane -22R	17.2	12.18	13.69	11.89	14.4
18a(H)-22,29,30-Trisnorneohopane -TS	73.86	52.67	63.05	53.89	64.95
17a(H)-22,29,30-Trisnorhopane -TM	89.94	62.63	75.17	62.87	74.33
17a(H),21b(H)-28,30-Bisnorhopane	21.53	14.12	20.94	12.25	13.48
17a(H),21b(H)-25-Norhopane	21.69	11.22	15.18	12.81	13.43
30-Norhopane	278.72	204.1	245.94	195.76	231.82
18a(H)-30-Norneohopane -C29Ts	91.27	62.57	73.88	68.33	80.77
17a(H)-Diahopane	24.92	16.4	20.69	19.11	21.13
30-Normoretane	43.94	34.47	38.7	33.81	41.22
18a(H) & 18b(H)-Oleananes	42.55	29.66	32.28	30.2	35.06
Hopane	386.74	279.97	323.29	271.02	320.32
Moretane	71.91	51.55	55.43	49.55	60.06
30-Homohopane -22S	137.75	100.91	129.98	95.62	112.89
30-Homohopane -22R	102.83	76.15	95.9	69.38	84.26
30-Bishomohopane -22S	72.74	53.7	71.97	52.86	63.71
30,31-Bishomohopane -22R	71.8	55.37	69.34	49.75	62.35
30,31-Trishomohopane -22S	71.53	53.3	67.98	51.09	60.79
30,31-Trishomohopane -22R	37.65	25.71	37.33	27.43	31.83
Tetrakishomohopane -22S	154.49	136.5	188.59	146.12	169.38
Tetrakishomohopane -22R	19.15	13.31	23.56	13.15	16.08
Pentakishomohopane -22S	28.18	21.33	26.6	17.15	23.22
Pentakishomohopane -22R	21.39	15.4	21.32	14.26	16.93
13b(H),17a(H)-20S-Diacholestane	69.46	48.67	58.38	47.43	58.11
13b(H),17a(H)-20R-Diacholestane	39.77	27.98	32.29	27.22	34.33
13b(H),17a(H)-20S-Methyldiacholestane	45.8	33.9	37.19	32.02	40.64
14a(H),17a(H)-20S-Cholestane	129.18	91.91	106.05	88.68	107
14b(H),17b(H)-20R-Cholestane	69.61	47.68	57.35	45.85	55.88
14b(H),17b(H)-20S-Cholestane	64.89	48.73	57.99	45.96	54.9
Cholestane	107.53	77.64	94.82	75.87	95.58
14a(H),17a(H)-20S-methylcholestane	55.4	39.26	48.77	35.25	44.9
14b(H),17b(H)-20R-Methylcholestane	77.07	56.36	66.73	51.1	61.3
14b(H),17b(H)-20S-Methylcholestane	75.63	53.91	63.79	52.63	58.68
14a(H),17a(H)-20R-methylcholestane	38.48	30.15	37.33	28.95	32.66
14a(H),17a(H)-20S-Ethylcholestane	64.53	47.79	58.49	43.09	57.17
14b(H),17b(H)-20R-Ethylcholestane	118.92	94.94	110.55	91.63	106.41
14b(H),17b(H)-20S-Ethylcholestane	96.58	64.58	82.35	58.91	75.11
14a(H),17a(H)-20R-Ethylcholestane	64.86	49.99	57.85	42.82	53.96

Surrogate Recoveries (%)

5b(H)-Cholane	115	151 &	144 &	92	119

& - Value exceeds acceptance criteria

Client Sample ID	SD-A-20-44-45	SD-A-14-57-58	SD-A-11-17.5-18.5	SD-R-1-42.5-43.5	SD-US-7-0-0.5-103006
Battelle Sample ID	R5492-P	R5493-P	R5494-P	R5504-P	R4042-P
Sample Type	SA	SA	SA	SA	SA
Collection Date	12/04/06	12/04/06	12/01/06	12/05/06	10/30/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07	11/10/06
Analysis Date	01/25/07	01/25/07	01/25/07	01/25/07	11/23/06
Analytical Instrument	MS	MS	MS	MS	MS
% Moisture	45.29	31.65	43.85	44.03	59.28
% Lipid	NA	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	16.61	10.31	8.49	8.77	12.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	25.35	16.34	330.63	48.01	3.37
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	189.8	70.34	310.2 J	223.71	52.69
C24 Tricyclic Terpane	135.22	49.46	U	139.66	35.67
C25 Tricyclic Terpane	158.64	77.41	U	105.67	51.36
C24 Tetracyclic Terpane	97.9	33.55	U	100.14	30.88
C26 Tricyclic Terpane -22S	66.72	26.6	U	67.14	16.88
C26 Tricyclic Terpane -22R	57.66	22.81	U	52.85	17.39
C28 Tricyclic Terpane -22S	73.3	27.37	U	70.48	16.71
C28 Tricyclic Terpane -22R	74.55	30.23	U	74.55	14.51
C29 Tricyclic Terpane -22S	87.46	31.91	U	80.89	21.07
C29 Tricyclic Terpane -22R	81.3	31.19	U	76.36	21.14
18a(H)-22,29,30-Trisnorneohopane -TS	285.1	95.32	397.27	265.32	87.9
17a(H)-22,29,30-Trisnorhopane -TM	343.45	109.8	442.39	335	98.86
17a(H),21b(H)-28,30-Bisnorhopane	61.44	28.44	U	78.46	34.56
17a(H),21b(H)-25-Norhopane	71.35	24.08	U	59.91	25.02
30-Norhopane	883.92	283.04	1222.67	881.89	294.42
18a(H)-30-Norneohopane -C29Ts	274.59	170.98	483.15	466.15	93.46
17a(H)-Diahopane	106.32	33.04	U	102.49	28.56
30-Normoretane	223.15	113.88	341.68 J	267.75	52.11
18a(H) & 18b(H)-Oleananes	170.03	50.47	281.39 J	144.22	51.72
Hopane	1452.85	457.4	2031.62	1467.32	426.57
Moretane	291.65	94.5	334.09 J	290.59	77.28
30-Homohopane -22S	397.37	124.85	480.27	381.69	144.52
30-Homohopane -22R	303.81	91.98	382.51	256.15	114.51
30-Bishomohopane -22S	197.08	63.85	260.66 J	188.12	88.13
30,31-Bishomohopane -22R	208.01	66.94	282.58 J	209.6	68.78
30,31-Trishomohopane -22S	154.4	51.74	U	143.61	70.97
30,31-Trishomohopane -22R	95.81	34.3	U	94.61	37.23
Tetrakishomohopane -22S	221.22	115.43	U	264.09	33.29
Tetrakishomohopane -22R	46.2	19.59	U	47.79 J	17.25
Pentakishomohopane -22S	50.46	19.51	U	U	24.95
Pentakishomohopane -22R	48.82	20.47	U	U	17.32
13b(H),17a(H)-20S-Diacholestane	312.17	113.08	390.84	307.41	80.35
13b(H),17a(H)-20R-Diacholestane	187.28	68.56	238.76 J	180.48	42.16
13b(H),17a(H)-20S-Methyldiacholestane	192.89	73.5	240.79 J	200.86	49.93
14a(H),17a(H)-20S-Cholestane	565.68	207.33	542.58	537.09	89.18
14b(H),17b(H)-20R-Cholestane	329.4	132.72	336.6 J	318.62	62.56
14b(H),17b(H)-20S-Cholestane	321.76	127.34	334.4 J	313.85	56.88
Cholestane	571.37	218.7	606.96	558.3	116.45
14a(H),17a(H)-20S-methylcholestane	241.45	88.46	182.16 J	246.24	44.23
14b(H),17b(H)-20R-Methylcholestane	338.05	134.41	330.35 J	340.94	70.64
14b(H),17b(H)-20S-Methylcholestane	329.82	132.24	315.82 J	310.45	65.47
14a(H),17a(H)-20R-methylcholestane	310.99	118.18	360.09	280.49	37.49
14a(H),17a(H)-20S-Ethylcholestane	253.85	98.16	289.12 J	238.63	61.51
14b(H),17b(H)-20R-Ethylcholestane	462.74	182.17	533.96	445.58	99.6
14b(H),17b(H)-20S-Ethylcholestane	334.92	132.58	368.71	340.02	77.4
14a(H),17a(H)-20R-Ethylcholestane	354.54	128.92	413.65	307.14	65.28

Surrogate Recoveries (%)

5b(H)-Cholane	1078 &	618 &	35017 &	5194 &	116

& - Value exceeds acceptance criteria

Client Sample ID	SD-US-8-0-0.5-103006	SD-US-9-0-0.5-103006	SD-US-10-0-0.5-103006	SD-PAH-3-0-0.5-103006 Replicate of US-10
Battelle Sample ID	R4043-P	R4044-P	R4045-P	R4046-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/23/06	11/23/06	11/23/06	12/03/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	63.36	63.78	58.63	58.92
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	11.23	11.20	12.64	12.36
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	7.50	4.14	3.33	6.81
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	42.49	35.19	44.95	57.26
C24 Tricyclic Terpane	29.14	24.19	30.51	38.14
C25 Tricyclic Terpane	43.13	38.53	44.57	53.73
C24 Tetracyclic Terpane	28.51	25.15	26.3	32
C26 Tricyclic Terpane -22S	15.11	16.13	13.32	16.64
C26 Tricyclic Terpane -22R	13.44	12.79	14	18.2
C28 Tricyclic Terpane -22S	12.76	12.27	14.36	13.82
C28 Tricyclic Terpane -22R	11.72	10.82	12.37	15.34
C29 Tricyclic Terpane -22S	17.19	14.59	17.49	21.31
C29 Tricyclic Terpane -22R	18.25	14.27	17.15	20.37
18a(H)-22,29,30-Trisnorneohopane -TS	74.63	60.88	75.22	89.44
17a(H)-22,29,30-Trisnorhopane -TM	79.08	68.76	81.96	98.25
17a(H),21b(H)-28,30-Bisnorhopane	31.86	24.8	33.55	44.19
17a(H),21b(H)-25-Norhopane	21.43	19.47	28.2	25.81
30-Norhopane	244.49	202.93	252.26	299.94
18a(H)-30-Norneohopane -C29Ts	79.42	66.32	81.57	103.39
17a(H)-Diahopane	20.94	22.06	22.08	28.2
30-Normoretane	47.59	38.19	43.9	57.84
18a(H) & 18b(H)-Oleananes	41.82	29.35	43.41	50.62
Hopane	351.69	280.51	357	426.42
Moretane	63.28	45.92	65.09	64.32
30-Homohopane -22S	129.52	108.38	133.06	149.72
30-Homohopane -22R	99.08	84.16	98.42	116.87
30-Bishomohopane -22S	79.23	60.25	75.77	88.41
30,31-Bishomohopane -22R	65.19	51.38	59.65	72.84
30,31-Trishomohopane -22S	66.92	55.35	64.22	72.36
30,31-Trishomohopane -22R	35.51	28.91	31.32	39.55
Tetrakishomohopane -22S	34.4	19.04	19.53	32.41
Tetrakishomohopane -22R	21.78	15.52	18.66	20.69
Pentakishomohopane -22S	28.98	18.87	26.38	26.23
Pentakishomohopane -22R	16.96	15.61	17.18	25.16
13b(H),17a(H)-20S-Diacholestane	62.63	58.76	69.38	83.63
13b(H),17a(H)-20R-Diacholestane	36.68	24.87	35.51	45.19
13b(H),17a(H)-20S-Methyldiacholestane	39.66	28.79	37.17	49.34
14a(H),17a(H)-20S-Cholestane	63.29	57	71.85	88.31
14b(H),17b(H)-20R-Cholestane	53.74	40.8	54.72	67.89
14b(H),17b(H)-20S-Cholestane	51.79	41.2	48.36	66.43
Cholestane	88.89	79.26	94.39	113.14
14a(H),17a(H)-20S-methylcholestane	37.55	35.15	37.4	46.33
14b(H),17b(H)-20R-Methylcholestane	60.41	45.11	59.44	72.86
14b(H),17b(H)-20S-Methylcholestane	61.5	40.83	59.99	67.35
14a(H),17a(H)-20R-methylcholestane	34.78	30.08	35.35	38.4
14a(H),17a(H)-20S-Ethylcholestane	50.37	40.47	50.58	58.31
14b(H),17b(H)-20R-Ethylcholestane	88.86	67.38	87.99	103.99
14b(H),17b(H)-20S-Ethylcholestane	68.53	56.62	71.42	85.3
14a(H),17a(H)-20R-Ethylcholestane	55.56	51.16	58.92	69.41

Surrogate Recoveries (%)

5b(H)-Cholane	118	102	103	87

& - Value exceeds acceptance criteria

Client Sample ID	SD-PAH-4-0-0.5-103006	SD-PAH-2-0-0.5-103006	SD-US-2-0-0.5-103006	SD-A-16-0-0.5-103006
	Replicate of US-10			
Battelle Sample ID	R4047-P	R4048-P	R4049-P	R4050-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	12/03/06	12/03/06	11/24/06	11/24/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	60.37	52.07	50.12	50.32
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	11.91	14.47	15.21	15.18
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	7.07	2.91	11.07	5.55
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	53.09	48.4	216.8	30.93
C24 Tricyclic Terpane	37.49	32.26	138.99	22.37
C25 Tricyclic Terpane	59.69	45.6	168.56	34.22
C24 Tetracyclic Terpane	32.19	28.93	149.05	20.67
C26 Tricyclic Terpane -22S	16.37	15.03	59.8	9.55
C26 Tricyclic Terpane -22R	15.06	14.95	60.07	9.6
C28 Tricyclic Terpane -22S	16.39	14.82	64.93	8.46
C28 Tricyclic Terpane -22R	14.94	11.69	51.01	7.4
C29 Tricyclic Terpane -22S	21.12	17.1	63.71	8.79
C29 Tricyclic Terpane -22R	22.23	21.26	79.29	15.68
18a(H)-22,29,30-Trisnorneohopane -TS	87.79	75.94	335.53	47.41
17a(H)-22,29,30-Trisnorhopane -TM	91.95	84.32	366.65	53.24
17a(H),21b(H)-28,30-Bisnorhopane	44.54	39.29	125.1	26.93
17a(H),21b(H)-25-Norhopane	25.51	29.07	78.26	15.1
30-Norhopane	286.41	246.66	935.72	190.58
18a(H)-30-Norneohopane -C29Ts	83.97	88.27	305.62	51.62
17a(H)-Diahopane	28.5	25.47	98.75	13.06
30-Normoretane	52.7	54.93	195.09	31.6
18a(H) & 18b(H)-Oleananes	51.37	45.65	156.33	28.32
Hopane	410.62	365.24	1368.51	249.05
Moretane	77.83	64.99	241.86	40.38
30-Homohopane -22S	147.03	120.48	406.92	110.7
30-Homohopane -22R	120.11	96.55	302.18	80.27
30-Bishomohopane -22S	86.13	71.48	198.11	65.68
30,31-Bishomohopane -22R	72.36	61.06	156.73	52.35
30,31-Trishomohopane -22S	72.78	60.26	133.2	50.74
30,31-Trishomohopane -22R	42.19	31.3	87.47	31.59
Tetrakishomohopane -22S	32.81	28.93	66.42	23.06
Tetrakishomohopane -22R	22.07	17	50.45	18.64
Pentakishomohopane -22S	31.56	26.75	56.89	28.76
Pentakishomohopane -22R	19.2	19.78	42.54	19.14
13b(H),17a(H)-20S-Diacholestane	82.83	68.3	294.63	38.83
13b(H),17a(H)-20R-Diacholestane	47.51	37.42	180.11	22.91
13b(H),17a(H)-20S-Methyldiacholestane	50.66	38.98	162.17	25.71
14a(H),17a(H)-20S-Cholestane	77.73	74.99	284	47.16
14b(H),17b(H)-20R-Cholestane	62.07	52.95	218.55	38
14b(H),17b(H)-20S-Cholestane	58.85	51.61	201.95	33.53
Cholestane	120.94	107.34	441.06	69.12
14a(H),17a(H)-20S-methylcholestane	56.85	34.98	127.01	24.14
14b(H),17b(H)-20R-Methylcholestane	66.83	58.6	198.24	46.3
14b(H),17b(H)-20S-Methylcholestane	70.25	57.42	206.85	48.34
14a(H),17a(H)-20R-methylcholestane	41.67	32.77	161.44	27.53
14a(H),17a(H)-20S-Ethylcholestane	64.5	52.19	183.07	43.82
14b(H),17b(H)-20R-Ethylcholestane	99.68	84.28	295.67	72.04
14b(H),17b(H)-20S-Ethylcholestane	83.3	66.02	214.39	53.11
14a(H),17a(H)-20R-Ethylcholestane	68.32	59.45	237.11	47.59

Surrogate Recoveries (%)

5b(H)-Cholane	97	108	137 &	460 &

& - Value exceeds acceptance criteria

Client Sample ID	SD-US-3-0-0.5-103006	SD-US-1-0-0.5-103006	SD-US-8-0-0.5-103106	SD-DS-5-0-0.5-103106
Battelle Sample ID	R4051-P	R4052-P	R4053-P	R4054-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/31/06	10/31/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	12/03/06	12/03/06	11/24/06	11/24/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	54.26	55.25	59.88	51.48
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.92	13.85	12.12	14.63
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	3.03	3.04	3.47	2.88
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	39.12	32.14	30.44	39.59
C24 Tricyclic Terpane	26.53	23.65	20.42	27.87
C25 Tricyclic Terpane	37.67	30.28	28.49	43.45
C24 Tetracyclic Terpane	24.3	20.52	17.37	24.27
C26 Tricyclic Terpane -22S	13.15	9.77	9.69	12.45
C26 Tricyclic Terpane -22R	13.09	10.74	9.86	12.52
C28 Tricyclic Terpane -22S	10.58	10.2	9.67	13.07
C28 Tricyclic Terpane -22R	9.8	9.68	8.63	11.64
C29 Tricyclic Terpane -22S	16.06	13.17	12.29	14.78
C29 Tricyclic Terpane -22R	13.73	12.5	12.35	16.24
18a(H)-22,29,30-Trisnorneohopane -TS	64.58	52.64	54.58	63.94
17a(H)-22,29,30-Trisnorhopane -TM	72.74	60.92	54.24	72.59
17a(H),21b(H)-28,30-Bisnorhopane	38.05	27.96	25.41	32.07
17a(H),21b(H)-25-Norhopane	18.53	15.28	14.35	20.18
30-Norhopane	215.4	180.13	169.76	213.93
18a(H)-30-Norneohopane -C29Ts	75.56	58.09	63.9	74.38
17a(H)-Diahopane	25.07	18.06	17.38	23.63
30-Normoretane	63.23	43.84	43.91	44.6
18a(H) & 18b(H)-Oleananes	32.67	26.39	30.37	37.7
Hopane	298.57	255.53	242.59	302.92
Moretane	52.77	42.13	45.06	56.02
30-Homohopane -22S	111.18	95.04	94.5	115.43
30-Homohopane -22R	88.19	76.87	73.56	88.26
30-Bishomohopane -22S	64.93	54.3	64.2	63.99
30,31-Bishomohopane -22R	54.41	44.09	45.41	52.38
30,31-Trishomohopane -22S	54.81	47.6	46.2	50.85
30,31-Trishomohopane -22R	28.14	24.58	22.66	28.57
Tetrakishomohopane -22S	20.08	15.72	18.13	30.02
Tetrakishomohopane -22R	15.98	14.27	12.17	16.86
Pentakishomohopane -22S	22.87	18.94	22.55	23.87
Pentakishomohopane -22R	13.66	12.34	12.02	14.92
13b(H),17a(H)-20S-Diacholestane	58.04	48.41	49.17	58.16
13b(H),17a(H)-20R-Diacholestane	30.33	25.57	24.78	31.87
13b(H),17a(H)-20S-Methyldiacholestane	33.14	30.8	27.69	34.75
14a(H),17a(H)-20S-Cholestane	62.13	52.37	46.74	66.98
14b(H),17b(H)-20R-Cholestane	48.41	40.33	38.41	44.09
14b(H),17b(H)-20S-Cholestane	45.38	35.37	36.77	40.62
Cholestane	85.8	78.57	73.29	88.25
14a(H),17a(H)-20S-methylcholestane	29.74	26.95	26.72	31.67
14b(H),17b(H)-20R-Methylcholestane	49.03	43.28	39.89	48.13
14b(H),17b(H)-20S-Methylcholestane	49.75	41.84	41.25	51.44
14a(H),17a(H)-20R-methylcholestane	33.06	27.36	27.32	32.56
14a(H),17a(H)-20S-Ethylcholestane	46.75	39.2	38.2	41.27
14b(H),17b(H)-20R-Ethylcholestane	75.38	63.28	60.53	75.59
14b(H),17b(H)-20S-Ethylcholestane	57.54	51.26	46.38	55.81
14a(H),17a(H)-20R-Ethylcholestane	52.63	44.76	39.73	53.63

Surrogate Recoveries (%)

5b(H)-Cholane	109	95	89	249 &

& - Value exceeds acceptance criteria

Client Sample ID	SD-DS-10-0-0.5-103106	SD-PAH-1-0-0.5-103106	SD-DS-2-0-0.5-103106	DUP-103106 Duplicate of DS-2
Battelle Sample ID	R4055-P	R4056-P	R4057-P	R4058-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/31/06	10/31/06	10/31/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	12/03/06	11/24/06	11/24/06	11/24/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	58.68	62.9	52.36	55.75
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	12.62	11.33	14.53	13.66
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	6.67	3.72	5.80	3.08
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	105.85	35.38	51.04	43.32
C24 Tricyclic Terpane	73.1	27.09	34.64	27.98
C25 Tricyclic Terpane	86.23	35	49.99	44.5
C24 Tetracyclic Terpane	58.64	21.92	28.83	22.98
C26 Tricyclic Terpane -22S	35.2	11.36	15.65	12.86
C26 Tricyclic Terpane -22R	37.94	11.62	15.22	13.26
C28 Tricyclic Terpane -22S	36.84	10.53	15.52	13.43
C28 Tricyclic Terpane -22R	32.76	10.81	16.72	12.51
C29 Tricyclic Terpane -22S	43.99	14.78	19.14	15.17
C29 Tricyclic Terpane -22R	47.13	15.03	20.93	18.94
18a(H)-22,29,30-Trisnorneohopane -TS	175.37	64.8	83.13	65.65
17a(H)-22,29,30-Trisnorhopane -TM	196.44	70.08	89.11	74.1
17a(H),21b(H)-28,30-Bisnorhopane	88.59	23.75	34.57	27.82
17a(H),21b(H)-25-Norhopane	62.77	18.45	25.79	18.25
30-Norhopane	534.75	202.36	258.64	208.85
18a(H)-30-Norneohopane -C29Ts	197.72	68.88	84.19	62.12
17a(H)-Diahopane	59.47	25.87	28.19	20.17
30-Normoretane	106.04	52.72	50.93	42.76
18a(H) & 18b(H)-Oleananes	104.91	42.95	53.47	36.51
Hopane	838.69	299.25	382.23	308.7
Moretane	131.13	52.97	66.19	58.38
30-Homohopane -22S	266.67	108.88	142.03	110.29
30-Homohopane -22R	207.65	84.46	103.13	82.69
30-Bishomohopane -22S	150.43	66.5	73.39	61.44
30,31-Bishomohopane -22R	120.36	50.66	63.27	50.53
30,31-Trishomohopane -22S	104.88	53.01	60.88	48.43
30,31-Trishomohopane -22R	70.93	26.09	34.47	28.73
Tetrakishomohopane -22S	52.98	22.69	23.73	20.04
Tetrakishomohopane -22R	36.67	15.13	18.51	15.14
Pentakishomohopane -22S	45.93	24.42	30.46	21.6
Pentakishomohopane -22R	31.91	15.13	17.35	14.23
13b(H),17a(H)-20S-Diacholestane	179.01	61.44	80.31	62.61
13b(H),17a(H)-20R-Diacholestane	102.88	30.27	46.63	37.19
13b(H),17a(H)-20S-Methyldiacholestane	115.15	33.59	51.44	40.21
14a(H),17a(H)-20S-Cholestane	186.24	58.02	72.61	63.37
14b(H),17b(H)-20R-Cholestane	136.27	48.16	64.44	53.93
14b(H),17b(H)-20S-Cholestane	134.18	42.92	59.77	48.63
Cholestane	268.19	92.39	124.3	98.75
14a(H),17a(H)-20S-methylcholestane	90.29	29.64	41.57	30.88
14b(H),17b(H)-20R-Methylcholestane	133.75	49.51	66.19	54.58
14b(H),17b(H)-20S-Methylcholestane	146.2	51.5	67.34	56.16
14a(H),17a(H)-20R-methylcholestane	101.69	35.44	42.68	34.97
14a(H),17a(H)-20S-Ethylcholestane	120.22	43.28	58.68	45.77
14b(H),17b(H)-20R-Ethylcholestane	188.62	73.04	102.51	82.07
14b(H),17b(H)-20S-Ethylcholestane	153.92	61.79	74	53.94
14a(H),17a(H)-20R-Ethylcholestane	146.57	59.3	70.76	58.13

Surrogate Recoveries (%)

5b(H)-Cholane	95	110	222 &	220

& - Value exceeds acceptance criteria

Client Sample ID	SD-DS-3-0-0.5-103106	SD-B-19-0-0.5-102406	SD-A-06-0-0.5-102406	SD-A-07-0-0.5-102406
Battelle Sample ID	R4059-P	R3943-P	R3952-P	R3953-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/24/06	10/24/06	10/24/06
Extraction Date	11/10/06	11/06/06	11/06/06	11/06/06
Analysis Date	12/03/06	11/23/06	12/03/06	11/23/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	57.3	54.56	57.19	56.21
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.22	13.66	6.52	6.63
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	6.37	6.17	25.83	25.40
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
C23 Tricyclic Terpane	58.79	38.59	83.69	72.18
C24 Tricyclic Terpane	40.57	28.17	42.23	42.06
C25 Tricyclic Terpane	61.71	37.17	124.5	143.57
C24 Tetracyclic Terpane	34.73	24.21	41.96	41.53
C26 Tricyclic Terpane -22S	19.1	14.23	24.96 J	25.1 J
C26 Tricyclic Terpane -22R	18.1	13.7	26.81	27.82
C28 Tricyclic Terpane -22S	18.57	12.71	16.96 J	21.49 J
C28 Tricyclic Terpane -22R	16.74	11.5	19.02 J	19.55 J
C29 Tricyclic Terpane -22S	22.28	14.75	27.27	22.2 J
C29 Tricyclic Terpane -22R	26.58	14.48	34.74	25.44
18a(H)-22,29,30-Trisnorneohopane -TS	97.77	68.39	111.9	106.28
17a(H)-22,29,30-Trisnorhopane -TM	106.32	75.09	121.32	132.02
17a(H),21b(H)-28,30-Bisnorhopane	44.75	26.01	57.33	44.89
17a(H),21b(H)-25-Norhopane	30.31	18.11	36.07	27.02
30-Norhopane	309.06	223.86	356.33	341
18a(H)-30-Norneohopane -C29Ts	101.72	62.44	106.23	103.77
17a(H)-Diahopane	38.66	21.67	35.29	30.12
30-Normoretane	70.76	41.23	73.26	60.5
18a(H) & 18b(H)-Oleananes	60.01	38.11	58.95	60.24
Hopane	453.07	315.07	492.88	480.68
Moretane	75.21	57.71	88.36	92.48
30-Homohopane -22S	163.38	112.46	176.15	183.66
30-Homohopane -22R	121.63	86.3	146.06	145.38
30-Bishomohopane -22S	86.4	64.07	109.36	106.21
30,31-Bishomohopane -22R	79.62	53.05	90.76	88.03
30,31-Trishomohopane -22S	69.47	56.91	92.59	88.05
30,31-Trishomohopane -22R	43.07	28.87	51.12	47.98
Tetrakishomohopane -22S	33.83	22.62	35.89	37.86
Tetrakishomohopane -22R	20.57	14.01	28.42	26.63
Pentakishomohopane -22S	28.87	24.82	44.66	38.92
Pentakishomohopane -22R	18.99	15.84	26.42	20.51 J
13b(H),17a(H)-20S-Diacholestane	93.23	56.95	88.48	77.38
13b(H),17a(H)-20R-Diacholestane	50.34	32.71	54.26	49.67
13b(H),17a(H)-20S-Methyldiacholestane	54.02	37.32	63.81	63.96
14a(H),17a(H)-20S-Cholestane	96.3	71.22	94.3	68.9
14b(H),17b(H)-20R-Cholestane	70.71	46.6	75.42	80.09
14b(H),17b(H)-20S-Cholestane	65.56	44.23	67.33	60.89
Cholestane	137.36	84.38	153.07	15.15
14a(H),17a(H)-20S-methylcholestane	50.91	46.66	75.22	48.72
14b(H),17b(H)-20R-Methylcholestane	72.11	52.38	86.2	80.16
14b(H),17b(H)-20S-Methylcholestane	77.56	51.23	87.42	75.62
14a(H),17a(H)-20R-methylcholestane	52.22	34.7	65.99	65.47
14a(H),17a(H)-20S-Ethylcholestane	64.35	45.67	82.83	74.69
14b(H),17b(H)-20R-Ethylcholestane	111.31	80.91	123.98	120.88
14b(H),17b(H)-20S-Ethylcholestane	88.61	59.08	101.69	85.27
14a(H),17a(H)-20R-Ethylcholestane	78.63	52.28	84.65	105.31

Surrogate Recoveries (%)

5b(H)-Cholane	117	78	736 &	1570 &

& - Value exceeds acceptance criteria

Client Sample ID	SD-A-23-0-0.5-102406	SD-A-25-0-0.5-102406	MW-116BD-101606	MW-105D-101606
Battelle Sample ID	R3955-P	R3956-P	R3836-P	R3837-P
Sample Type	SA	SA	SA	SA
Collection Date	10/24/06	10/24/06	10/16/06	10/16/06
Extraction Date	11/06/06	11/06/06	11/22/06	11/22/06
Analysis Date	11/23/06	11/23/06	11/27/06	11/28/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	55.9	49.64	NA	NA
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	NAPL	NAPL
Sample Size	13.39	15.10	130.00	145.00
Size Unit-Basis	G_DRY	G_DRY	MG_OIL	MG_OIL
Reporting Limit	6.29	5.58	5.00	4.48
Units	NG/G_DRY	NG/G_DRY	MG/KG_OIL	MG/KG_OIL
C23 Tricyclic Terpane	34.48	28.09	U	U
C24 Tricyclic Terpane	22.12	19.33	U	2.59 J
C25 Tricyclic Terpane	37.09	29.28	U	U
C24 Tetracyclic Terpane	21.22	16.33	45.58	U
C26 Tricyclic Terpane -22S	10.86	7.94	U	U
C26 Tricyclic Terpane -22R	11.57	8.25	U	1.83 J
C28 Tricyclic Terpane -22S	9.77	9.64	U	U
C28 Tricyclic Terpane -22R	8.76	8.37	1.29 J	U
C29 Tricyclic Terpane -22S	12.99	10.23	U	2.14 J
C29 Tricyclic Terpane -22R	13.44	11.87	1.05 J	1.61 J
18a(H)-22,29,30-Trisnorneohopane -TS	57.64	45.96	U	3.18 J
17a(H)-22,29,30-Trisnorhopane -TM	65.15	53.45	U	3.13 J
17a(H),21b(H)-28,30-Bisnorhopane	25.61	21.04	U	U
17a(H),21b(H)-25-Norhopane	15.72	14.35	U	U
30-Norhopane	193.13	159.68	1.72 J	5.43
18a(H)-30-Norneohopane -C29Ts	58.72	46.52	U	1.26 J
17a(H)-Diahopane	20.13	13.76	U	U
30-Normoretane	32.06	32.29	U	U
18a(H) & 18b(H)-Oleananes	29.2	27.02	U	U
Hopane	278.85	228.02	2.14 J	6.12
Moretane	48.3	43.17	U	3.7 J
30-Homohopane -22S	103.49	85.59	U	2.29 J
30-Homohopane -22R	81.25	69.06	U	1.27 J
30-Bishomohopane -22S	59.21	48.85	U	U
30,31-Bishomohopane -22R	50.61	45.54	U	U
30,31-Trishomohopane -22S	47.84	42.34	U	U
30,31-Trishomohopane -22R	26.51	21.88	U	U
Tetrakishomohopane -22S	17.69	17.04	U	U
Tetrakishomohopane -22R	12.35	13.67	U	U
Pentakishomohopane -22S	24.5	18.19	U	U
Pentakishomohopane -22R	13.34	11.13	U	U
13b(H),17a(H)-20S-Diacholestane	50.76	38.04	U	U
13b(H),17a(H)-20R-Diacholestane	25.21	21	U	U
13b(H),17a(H)-20S-Methyldiacholestane	32.13	25.63	U	U
14a(H),17a(H)-20S-Cholestane	56.29	36.9	2.59	5.17
14b(H),17b(H)-20R-Cholestane	42.33	34.94	U	5.81
14b(H),17b(H)-20S-Cholestane	38.99	30.93	U	2.59
Cholestane	78.3	57.56	U	2.56
14a(H),17a(H)-20S-methylcholestane	30.42	21.21	U	2.61
14b(H),17b(H)-20R-Methylcholestane	46.28	37.26	U	U
14b(H),17b(H)-20S-Methylcholestane	45.04	36.58	U	U
14a(H),17a(H)-20R-methylcholestane	27.79	25.31	U	2.3
14a(H),17a(H)-20S-Ethylcholestane	41.97	34.21	U	2.29
14b(H),17b(H)-20R-Ethylcholestane	68.37	56.43	U	U
14b(H),17b(H)-20S-Ethylcholestane	54.71	42.61	U	2.27
14a(H),17a(H)-20R-Ethylcholestane	50.84	42.9	U	1.98 J

Surrogate Recoveries (%)

5b(H)-Cholane	135 &	230 &	888 &	1011 &

& - Value exceeds acceptance criteria

Client Sample ID	Bulkhead-02-fp	MW-102AD-102606	Bulkhead Blank	EB-120606-SD
Battelle Sample ID	R3959-P	R3960-P	R3958-P	R4979-P
Sample Type	SA	SA	SA	SA
Collection Date	10/24/06	10/26/06	10/24/06	12/06/06
Extraction Date	11/22/06	11/22/06	11/22/06	12/13/06
Analysis Date	11/27/06	11/28/06	11/27/06	12/20/06
Analytical Instrument	MS	MS	MS	MS
% Moisture	NA	NA	NA	NA
% Lipid	NA	NA	NA	NA
Matrix	FILTER	NAPL	FILTER	EQUIPMENT BLANK
Sample Size	77.00	148.00	0.00	0.97
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL	L_LIQUID
Reporting Limit	8.44	4.39	650.00	20.62
Units	MG/KG_OIL	MG/KG_OIL	NG_OIL	NG/L_LIQUID
C23 Tricyclic Terpane	U	U	U	U
C24 Tricyclic Terpane	U	U	U	U
C25 Tricyclic Terpane	U	U	U	U
C24 Tetracyclic Terpane	U	U	U	U
C26 Tricyclic Terpane -22S	U	U	U	U
C26 Tricyclic Terpane -22R	U	U	U	U
C28 Tricyclic Terpane -22S	U	U	U	U
C28 Tricyclic Terpane -22R	1.55 J	U	U	U
C29 Tricyclic Terpane -22S	U	U	U	U
C29 Tricyclic Terpane -22R	2.54 J	1.47 J	U	U
18a(H)-22,29,30-Trisnorneohopane -TS	4.05 J	1.06 J	U	U
17a(H)-22,29,30-Trisnorhopane -TM	5.56 J	2.24 J	U	U
17a(H),21b(H)-28,30-Bisnorhopane	1.64 J	U	U	U
17a(H),21b(H)-25-Norhopane	U	U	U	U
30-Norhopane	12.61	2.68 J	U	U
18a(H)-30-Norneohopane -C29Ts	5.34 J	0.97 J	U	U
17a(H)-Diahopane	U	U	U	U
30-Normoretane	U	U	U	U
18a(H) & 18b(H)-Oleananes	U	U	U	U
Hopane	17.91	4.8	U	U
Moretane	5.4 J	2.07 J	U	U
30-Homohopane -22S	7.38 J	U	U	U
30-Homohopane -22R	6.29 J	U	U	U
30-Bishomohopane -22S	3.38 J	U	U	U
30,31-Bishomohopane -22R	U	U	U	U
30,31-Trishomohopane -22S	U	U	U	U
30,31-Trishomohopane -22R	U	U	U	U
Tetrakishomohopane -22S	U	U	U	U
Tetrakishomohopane -22R	U	U	U	U
Pentakishomohopane -22S	U	U	U	U
Pentakishomohopane -22R	U	U	U	U
13b(H),17a(H)-20S-Diacholestane	4.39	U	U	U
13b(H),17a(H)-20R-Diacholestane	5.28	U	U	U
13b(H),17a(H)-20S-Methyldiacholestane	6.96	U	U	U
14a(H),17a(H)-20S-Cholestane	U	3.38	U	U
14b(H),17b(H)-20R-Cholestane	7.06	U	U	U
14b(H),17b(H)-20S-Cholestane	U	U	U	U
Cholestane	4.41	U	U	U
14a(H),17a(H)-20S-methylcholestane	2.48 J	U	U	U
14b(H),17b(H)-20R-Methylcholestane	U	U	U	U
14b(H),17b(H)-20S-Methylcholestane	6.03	U	U	U
14a(H),17a(H)-20R-methylcholestane	2.62 J	U	U	U
14a(H),17a(H)-20S-Ethylcholestane	U	U	U	U
14b(H),17b(H)-20R-Ethylcholestane	U	U	U	U
14b(H),17b(H)-20S-Ethylcholestane	4.05 J	U	U	U
14a(H),17a(H)-20R-Ethylcholestane	4.12 J	U	U	U

Surrogate Recoveries (%)

5b(H)-Cholane	725 &	969 &	86	

& - Value exceeds acceptance criteria

Appendix C.

SHC and TPH Data Summary Tables

Client ID	SD-B16-0-0.5-111306	SD-A44-0-0.5-111306	SD-NA-3-0.0-0.5	SD-B-13-0.0-0.5
Battelle ID	R4193-P	R4194-P	R4975-P	R4976-P
Sample Type	SA	SA	SA	SA
Collection Date	11/13/06	11/13/06	12/07/06	12/07/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07
Analysis Date	01/10/07	01/10/07	01/11/07	01/11/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	54.83	49.85	51.73	55.29
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.76	15.13	14.74	13.61
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	306.03	278.32	285.69	309.40
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	U	U	U	U
n-Dodecane	U	U	U	U
n-Tridecane	U	U	U	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	258.37 J	203.16 J	258.82 J	259.22 J
Pristane	115.67 J	96.01 J	100.9 J	111.29 J
n-Octadecane	319.55	463.19	463.45	306.22 J
Phytane	89.94 J	59.22 J	83.87 J	80.63 J
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	950.85	525.83	489.16	581.42
n-Docosane	144.55 J	283.6	257.62 J	225.04 J
n-Tricosane	234.78 J	178.11 J	249.66 J	236.11 J
n-Tetracosane	173.36 J	220.98 J	227.01 J	154.69 J
n-Pentacosane	718.19	469.95	930.87	692.29
n-Hexacosane	421.7	372.12	373.23	260.24 J
n-Heptacosane	1720.68	1285.65	2022.12	1709.71
n-Octacosane	654.16	943.36	949.7	598.08
n-Nonacosane	1195.17	736.07	1383.17	987.81
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	664418.77	507921.98	623068.63	560036.28
TPH(resolved)	45193.17	37117.37	46079.26	38503.06

Surrogate Recoveries (%)

O-Terphenyl	85	83	89	75
5a-androstane	84	82	86	73

Client ID	DUP-120706-SD2 Duplicate of B-13	SD-A-20-44-45	SD-A-14-57-58	SD-A-11-17.5-18.5
Battelle ID	R4978-P	R5492-P	R5493-P	R5494-P
Sample Type	SA	SA	SA	SA
Collection Date	12/07/06	12/04/06	12/04/06	12/01/06
Extraction Date	01/04/07	01/04/07	01/04/07	01/04/07
Analysis Date	01/11/07	01/11/07	01/11/07	01/11/07
Analytical Instrument	FID	FID	FID	FID
% Moisture	54.64	45.29	31.65	43.85
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	13.81	16.61	10.31	8.49
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	304.92	1267.49	816.78	16531.33
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	U	U	U	U
n-Dodecane	U	U	U	U
n-Tridecane	U	U	U	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	20575.2	U
n-Hexadecane	U	U	17027.69	U
Norpristane (1650)	U	U	3129.97	U
n-Heptadecane	U	U	287.11 J	U
Pristane	U	U	2951.65	U
n-Octadecane	U	U	47799.41	U
Phytane	U	U	12594.8	U
n-Nonadecane	U	U	U	16492.78 J
n-Eicosane	U	U	U	25676.76
n-Heneicosane	602.98	1787.82	2480.73	74210.56
n-Docosane	252.9 J	2901.38	2912.05	83604.35
n-Tricosane	294.06 J	623.87 J	1144.88	U
n-Tetracosane	167.19 J	2170.66	1825.87	53753.43
n-Pentacosane	644.13	1367.08	1689.88	16542.94
n-Hexacosane	419.09	3526.66	2838.07	U
n-Heptacosane	1830.46	2446.22	2129.93	15326.3 J
n-Octacosane	666.85	4956.34	4229.17	139644.31
n-Nonacosane	U	U	2605.08	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	24093.69
n-Dotriacontane	U	U	U	94515.16
n-Tritriacontane	U	U	U	23508.03
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	578226.41	3711329.79	1904637.24	50177157.94
TPH(resolved)	37648.62	501942.92	566542.61	38218546.28

Surrogate Recoveries (%)

O-Terphenyl	87	79	71	92
5a-androstane	84	79	66	78

Client ID	SD-R-1-42.5-43.5	SD-US-7-0-0.5-103006	SD-US-8-0-0.5-103006	SD-US-9-0-0.5-103006
Battelle ID	R5504-P	R4042-P	R4043-P	R4044-P
Sample Type	SA	SA	SA	SA
Collection Date	12/05/06	10/30/06	10/30/06	10/30/06
Extraction Date	01/04/07	11/10/06	11/10/06	11/10/06
Analysis Date	01/11/07	11/29/06	11/22/06	11/22/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	44.03	59.28	63.36	63.78
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	8.77	12.49	11.23	11.20
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	2400.57	168.57	374.98	187.99
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	32.05 J	74.42 J	U
n-Undecane	U	27.24 J	26.4 J	U
n-Dodecane	U	22.93 J	25.65 J	U
n-Tridecane	U	43.72 J	50.16 J	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	1995.62 J	165.35 J	277.62 J	247.64
Pristane	10761.99	U	U	U
n-Octadecane	U	193.33	85.9 J	82.27 J
Phytane	U	U	U	U
n-Nonadecane	3456.26	U	U	U
n-Eicosane	7514.73	U	U	U
n-Heneicosane	U	300.62	609.32	461.71
n-Docosane	21578.96	158.72 J	U	157.41 J
n-Tricosane	4619.65	U	U	170.92 J
n-Tetracosane	17978.2	U	U	U
n-Pentacosane	9768.61	343.27	515.87	383.85
n-Hexacosane	25792.31	U	U	U
n-Heptacosane	11960.48	1418.55	2047.69	1972
n-Octacosane	31852.67	425.88	971.64	799.96
n-Nonacosane	U	867.52	993.79	1181.37
n-Triacontane	U	U	U	U
n-Hentriacontane	U	935.16	1254.41	1217.19
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	11263732.94	514821.31	593323.87	478297.44
TPH(resolved)	6483487.34	24474.82	25594.42	46172.58

Surrogate Recoveries (%)

O-Terphenyl	86	79	89	81
5a-androstane	80	76	87	78

Client ID	SD-US-10-0-0.5-103006	SD-PAH-3-0-0.5-103006	SD-PAH-4-0-0.5-103006	SD-PAH-2-0-0.5-103006
		Replicate of US-10	Replicate of US-10	
Battelle ID	R4045-P	R4046-P	R4047-P	R4048-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/22/06	11/22/06	11/22/06	11/22/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	58.63	58.92	60.37	52.07
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	12.64	12.36	11.91	14.47
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	166.57	340.70	353.57	145.51
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	68.49 J	60.26 J	30.26 J
n-Undecane	U	28.38 J	24.95 J	20.46 J
n-Dodecane	U	23.67 J	20.46 J	18.61 J
n-Tridecane	U	58.28 J	45.47 J	46.28 J
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	202.21	253.9 J	241.08 J	U
Pristane	U	U	U	U
n-Octadecane	62.74 J	86.1 J	94.1 J	U
Phytane	U	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	377.54	416.68	442.12	309.72
n-Docosane	138.89 J	U	U	U
n-Tricosane	U	U	U	U
n-Tetracosane	U	U	U	U
n-Pentacosane	304.26	390.36	289.02 J	278.37
n-Hexacosane	U	U	U	U
n-Heptacosane	1586.56	1873.97	1768.29	1212.76
n-Octacosane	642.71	1037.42	906.57	758.86
n-Nonacosane	768.04	1163.94	977.48	672.4
n-Triacontane	U	U	U	U
n-Hentriacontane	844.12	959.33	1044.57	575.95
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	516099.56	658037.71	595703.21	492178.99
TPH(resolved)	24647.93	36811.88	39283.40	17526.92

Surrogate Recoveries (%)

O-Terphenyl	74	89	88	74
5a-androstane	74	87	85	75

Client ID	SD-US-2-0-0.5-103006	SD-A-16-0-0.5-103006	SD-US-3-0-0.5-103006	SD-US-1-0-0.5-103006
Battelle ID	R4049-P	R4050-P	R4051-P	R4052-P
Sample Type	SA	SA	SA	SA
Collection Date	10/30/06	10/30/06	10/30/06	10/30/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/30/06	11/30/06	11/30/06	11/30/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	50.12	50.32	54.26	55.25
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	15.21	15.18	13.92	13.85
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	553.65	277.40	151.26	152.02
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	U	60.81 J	U	U
n-Undecane	U	U	U	U
n-Dodecane	U	U	U	U
n-Tridecane	U	71.07 J	U	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	98.26 J	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	3263	U	203.36	146.96 J
Pristane	U	U	U	U
n-Octadecane	2836.32	1378.24	102.51 J	65.75 J
Phytane	U	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	U	485.76	447.55	614.01
n-Docosane	U	723.13	253.29	203.31
n-Tricosane	U	U	183	U
n-Tetracosane	U	460.05	U	U
n-Pentacosane	U	U	386.49	275.38
n-Hexacosane	U	1030.09	U	334.69
n-Heptacosane	1491.25	1622.44	1748.94	1209.72
n-Octacosane	U	3059.96	563.5	473.16
n-Nonacosane	729.45	858.7	1289.44	883.65
n-Triacontane	U	U	U	U
n-Hentriacontane	U	1364.56	2155.6	1053.45
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	2570318.61	590747.31	464748.66	368806.89
TPH(resolved)	163186.45	94212.41	36556.41	24366.14

Surrogate Recoveries (%)

O-Terphenyl	74	86	84	79
5a-androstane	112	82	82	76

Client ID	SD-US-8-0-0.5-103106	SD-DS-5-0-0.5-103106	SD-DS-10-0-0.5-103106	SD-PAH-1-0-0.5-103106
Battelle ID	R4053-P	R4054-P	R4055-P	R4056-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/31/06	10/31/06	10/31/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/10/06
Analysis Date	11/30/06	11/30/06	11/30/06	11/30/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	59.88	51.48	58.68	62.9
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	12.12	14.63	12.62	11.33
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	173.72	143.92	333.68	185.83
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	23.89 J	U	U	U
n-Undecane	23.71 J	U	U	29.34 J
n-Dodecane	22.12 J	U	U	23.43 J
n-Tridecane	42.93 J	U	U	47.22 J
Isoprenoid RRT 1380	60.3 J	U	U	U
n-Tetradecane	46.38 J	U	U	U
Isoprenoid RRT 1470	72.77 J	U	U	U
n-Pentadecane	111.55 J	U	U	112.87 J
n-Hexadecane	44.28 J	U	U	U
Norpristane (1650)	79.53 J	U	U	U
n-Heptadecane	258.75	U	308.78 J	203
Pristane	133.32 J	U	1111.23	100.07 J
n-Octadecane	136.88 J	U	293.03 J	228.56
Phytane	98.88 J	U	991.38	77.12 J
n-Nonadecane	U	U	U	4027.77
n-Eicosane	U	U	U	U
n-Heneicosane	525.76	404.76	U	463.65
n-Docosane	183.31	324.19	U	189.37
n-Tricosane	190.05	U	U	132.47 J
n-Tetracosane	130.9 J	U	U	U
n-Pentacosane	400.71	U	U	298.21
n-Hexacosane	180.99	U	U	U
n-Heptacosane	2145.75	1289.38	2070.47	1452.47
n-Octacosane	410.71	1267.33	U	428.96
n-Nonacosane	1305.84	901.78	1560.46	1102.23
n-Triacontane	U	U	U	U
n-Hentriacontane	3575.97	1692.19	1469.57	2253.84
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	421614.02	525673.98	1419967.72	460441.96
TPH(resolved)	43030.56	42425.62	74936.79	36860.52

Surrogate Recoveries (%)

O-Terphenyl	74	75	94	84
5a-androstane	73	73	93	81

Client ID	SD-DS-2-0-0.5-103106	DUP-103106 Duplicate of DS-2	SD-DS-3-0-0.5-103106	SD-B-19-0-0.5-102406
Battelle ID	R4057-P	R4058-P	R4059-P	R3943-P
Sample Type	SA	SA	SA	SA
Collection Date	10/31/06	10/31/06	10/31/06	10/24/06
Extraction Date	11/10/06	11/10/06	11/10/06	11/06/06
Analysis Date	11/30/06	11/30/06	11/30/06	11/16/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	52.36	55.75	57.3	54.56
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	14.53	13.66	13.22	13.66
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	289.81	154.14	318.53	308.27
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	18.18 J	U
n-Decane	207.18 J	U	72.31 J	22.91 J
n-Undecane	33.91 J	24.42 J	34.85 J	23.82 J
n-Dodecane	36.82 J	26.11 J	41.59 J	22.85 J
n-Tridecane	125.55 J	94.1 J	106.74 J	46.08 J
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	69.73 J	U	88.42 J	U
Isoprenoid RRT 1470	180.43 J	U	U	U
n-Pentadecane	235.16 J	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	207.9 J	U	183.79 J	265.64 J
Pristane	U	U	U	U
n-Octadecane	676.18	577.38	1170.9	187.77 J
Phytane	U	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	455.34	383.67	385.11	847.55
n-Docosane	423.38	343.21	252.03 J	214.72 J
n-Tricosane	U	U	U	224.15 J
n-Tetracosane	U	U	U	U
n-Pentacosane	408.52	279.37	400.62	U
n-Hexacosane	U	U	U	U
n-Heptacosane	1594.78	1161.67	1505.33	U
n-Octacosane	1671.57	1398.86	1125.77	U
n-Nonacosane	1183.04	768.2	1014.71	839.11
n-Triacontane	U	U	U	U
n-Hentriacontane	1063.68	802.5	1151.09	978.15
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	606.56
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	717120.6	541440.25	658932.34	561850.14
TPH(resolved)	65302.11 J	38754.23 J	46817.89	22580.90

Surrogate Recoveries (%)

O-Terphenyl	87	72	88	95
5a-androstane	87	69	88	94

Client ID	SD-A-06-0-0.5-102406	SD-A-07-0-0.5-102406	SD-A-23-0-0.5-102406	SD-A-25-0-0.5-102406
Battelle ID	R3952-P	R3953-P	R3955-P	R3956-P
Sample Type	SA	SA	SA	SA
Collection Date	10/24/06	10/24/06	10/24/06	10/24/06
Extraction Date	11/06/06	11/06/06	11/06/06	11/06/06
Analysis Date	11/16/06	11/16/06	11/16/06	11/16/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	57.19	56.21	55.9	49.64
% Lipid	NA	NA	NA	NA
Matrix	SEDIMENT	SEDIMENT	SEDIMENT	SEDIMENT
Sample Size	6.52	6.63	13.39	15.10
Size Unit-Basis	G_DRY	G_DRY	G_DRY	G_DRY
Reporting Limit	1291.56	1270.14	314.49	278.84
Units	NG/G_DRY	NG/G_DRY	NG/G_DRY	NG/G_DRY
n-Nonane	U	U	U	U
n-Decane	349.53 J	380.45 J	U	U
n-Undecane	145.01 J	101.31 J	U	U
n-Dodecane	127.25 J	226.42 J	U	U
n-Tridecane	1205.14 J	321.22 J	U	U
Isoprenoid RRT 1380	293.8 J	U	U	U
n-Tetradecane	818.03 J	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	307.32 J	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	U	4935.48	U	U
Pristane	U	U	U	U
n-Octadecane	675.78 J	1682.33	U	U
Phytane	U	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	1569.92	9427.86	296.29 J	610.26
n-Docosane	2634.81	12516.7	415.77	648.49
n-Tricosane	U	U	234.97 J	260.12 J
n-Tetracosane	2279.59	10769.21	401.04	451.73
n-Pentacosane	1167.64 J	12962.73	U	403.21
n-Hexacosane	2691.47	7706.51	321.62	U
n-Heptacosane	3734.78	4443.37	1775.38	1803.92
n-Octacosane	3563.54	6165.35	2070.26	3096.76
n-Nonacosane	3403.42	15177.45	1467.17	2832.04
n-Triacontane	5151.53	U	419.1	666.12
n-Hentriacontane	2580.57	U	2453.02	866.07
n-Dotriacontane	6596.65	U	1838.38	618.8
n-Tritriacontane	4763.22	U	1832.06	767.62
n-Tetratriacontane	U	U	561.88	343.43
n-Pentatriacontane	U	U	116.82 J	319.64
n-Hexatriacontane	U	U	U	805.78
n-Heptatriacontane	U	U	U	582.25
n-Octatriacontane	U	U	U	180.24 J
n-Nonatriacontane	U	U	U	190.13 J
n-Tetracontane	U	U	U	U
TPH(total)	3053006.02	4031289.65	619373.69	577730.39
TPH(resolved)	868010.00	1576776.29	72822.36	70165.42

Surrogate Recoveries (%)

O-Terphenyl	104	104	80	94
5a-androstane	117	99	78	94

Client ID	MW-116BD-101606	MW-105D-101606	Bulkhead-02-fp	MW-102AD-102606
Battelle ID	R3836-P	R3837-P	R3959-P	R3960-P
Sample Type	SA	SA	SA	SA
Collection Date	10/16/06	10/16/06	10/24/06	10/26/06
Extraction Date	11/22/06	11/22/06	11/22/06	11/22/06
Analysis Date	12/01/06	12/01/06	12/01/06	12/01/06
Analytical Instrument	FID	FID	FID	FID
% Moisture	NA	NA	NA	NA
% Lipid	NA	NA	NA	NA
Matrix	NAPL	NAPL	FILTER	NAPL
Sample Size	130.00	145.00	77.00	148.00
Size Unit-Basis	MG_OIL	MG_OIL	MG_OIL	MG_OIL
Reporting Limit	288.46	258.62	487.01	253.38
Units	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL	MG/KG_OIL
n-Nonane	U	U	U	U
n-Decane	U	U	U	U
n-Undecane	U	U	U	U
n-Dodecane	U	U	U	U
n-Tridecane	U	U	U	U
Isoprenoid RRT 1380	U	U	U	U
n-Tetradecane	U	U	U	U
Isoprenoid RRT 1470	U	U	U	U
n-Pentadecane	U	U	U	U
n-Hexadecane	U	U	U	U
Norpristane (1650)	U	U	U	U
n-Heptadecane	U	U	U	U
Pristane	U	U	U	U
n-Octadecane	U	U	U	U
Phytane	U	U	U	U
n-Nonadecane	U	U	U	U
n-Eicosane	U	U	U	U
n-Heneicosane	U	U	U	U
n-Docosane	U	U	U	U
n-Tricosane	U	U	U	U
n-Tetracosane	U	U	U	U
n-Pentacosane	U	U	U	U
n-Hexacosane	U	U	U	U
n-Heptacosane	U	U	U	U
n-Octacosane	U	U	U	U
n-Nonacosane	U	U	U	U
n-Triacontane	U	U	U	U
n-Hentriacontane	U	U	U	U
n-Dotriacontane	U	U	U	U
n-Tritriacontane	U	U	U	U
n-Tetratriacontane	U	U	U	U
n-Pentatriacontane	U	U	U	U
n-Hexatriacontane	U	U	U	U
n-Heptatriacontane	U	U	U	U
n-Octatriacontane	U	U	U	U
n-Nonatriacontane	U	U	U	U
n-Tetracontane	U	U	U	U
TPH(total)	771700.93	628132.08	1004708.37	813156.68
TPH(resolved)	612374.85	445205.87	749551.03	610156.47

Surrogate Recoveries (%)

O-Terphenyl	108	110	107	106
5a-androstane	102	101	99	100

Client ID	Bulkhead Blank	EB-120606-SD
Battelle ID	R3958-P	R4979-P
Sample Type	SA	SA
Collection Date	10/24/06	12/06/06
Extraction Date	11/22/06	12/13/06
Analysis Date	12/01/06	12/15/06
Analytical Instrument	FID	FID
% Moisture	NA	NA
% Lipid	NA	NA
Matrix	FILTER	EQUIPMENT BLANK
Sample Size	0.00	0.97
Size Unit-Basis	MG_OIL	L_LIQUID
Reporting Limit	37500.00	1090.93
Units	NG_OIL	NG/L_LIQUID
n-Nonane	U	U
n-Decane	U	U
n-Undecane	U	U
n-Dodecane	U	U
n-Tridecane	U	U
Isoprenoid RRT 1380	U	U
n-Tetradecane	U	U
Isoprenoid RRT 1470	U	U
n-Pentadecane	U	U
n-Hexadecane	U	U
Norpristane (1650)	U	U
n-Heptadecane	U	U
Pristane	U	U
n-Octadecane	U	U
Phytane	U	U
n-Nonadecane	U	U
n-Eicosane	U	U
n-Heneicosane	U	U
n-Docosane	U	U
n-Tricosane	U	U
n-Tetracosane	U	U
n-Pentacosane	U	U
n-Hexacosane	U	U
n-Heptacosane	U	U
n-Octacosane	U	U
n-Nonacosane	U	U
n-Triacontane	U	U
n-Hentriacontane	U	U
n-Dotriacontane	U	U
n-Tritriacontane	U	U
n-Tetratriacontane	U	U
n-Pentatriacontane	U	U
n-Hexatriacontane	U	U
n-Heptatriacontane	U	U
n-Octatriacontane	U	U
n-Nonatriacontane	U	U
n-Tetracontane	U	U
TPH(total)	U	55986.84
TPH(resolved)	4882.49 J	Not reported

Surrogate Recoveries (%)

O-Terphenyl	108	97
5a-androstane	102	89

Appendix G
OU2 Geotechnical Data Summary